THE
METAL INDUSTRY
WITH WHICH ARE INCORPORATED
The Aluminum World — Copper and Brass — The Brass Founder and Finisher
ELECTRO-PLATERS REVIEW

Vol. 29 NEW YORK, APRIL, 1931 No. 4

Foundrymen Will Meet in Chicago

Plans for the Convention and Exhibition To Be Held At the Hotel Stevens, May 4-7, 1931

THE week of May 4 will witness the gathering of foundrymen from all parts of the United States and Canada for the thirty-fifth annual convention of the American Foundrymen's Association, which will be held at the Stevens Hotel, Chicago, Ill.

Round Table Non-Ferrous Discussions

One of the greatest factors in the success of recent conventions has been the informal round table discussion on shop practice. The 1930 non-ferrous foundry session of this character was a great success and very instructive, and the 1931 session should be equally interesting and instructive.

Members of the A. F. A. interested in non-ferrous foundry operation can help make the meeting a success by forwarding to the chairman of this session the subject matter of any problem pertaining to non-ferrous foundry work on which they may want information. These subjects will be presented at the round table meeting, where there will be foundrymen present from every part of this country and perhaps some foreign representatives. Nowhere else will it be possible, within so brief a period of time, to draw upon such a vast fund of accumulated knowledge and experience on non-ferrous foundry matters.

Foundrymen should not miss this non-ferrous round table meeting. They can contribute to the discussion and get the benefit of the experience of others in the same industry.

A tentative schedule of non-ferrous meetings and events for the Chicago convention begins in the next column:

Tentative Program

Monday, May 4—Morning:
Registration.
Business meetings.
Opening of exhibit of foundry equipment.

Tuesday, May 5—Morning:
Sand control shop-operation course, 1st session.
Pattern production.
Non-ferrous foundry costs.

Stevens Hotel, Chicago, Ill.

Prize Awards for Best 1930 Articles Are Announced on Page 164

Afternoon:
Foundry costs.
Non-ferrous shop-operation courses, 1st session.

Wednesday, May 6—Morning:
Sand control shop-operation course, 2nd session.
Non-ferrous founding.

Afternoon:
Non-ferrous founding round-table luncheon.
Sand research.
Apprentice training.
Non-ferrous shop-operation course, 2nd session.

Evening:
Annual A. F. A. Banquet.

Thursday, May 7—Morning:
Sand control shop-operation course, 3rd session.
Non-ferrous founding.

Afternoon:
Annual business meeting and special lecture.
Non-ferrous shop-operation course.

Convention Papers

A large number of worth-while papers have been submitted this year for presentation during Foundrymen's Week. The opportunity thus afforded of selecting only the very best of material for the convention has permitted arrangement of an excellent program.

These papers cover a wide range of subjects, dealing with every major phase of metal founding. In general, however, the results they describe exemplify a decided trend toward greater effort in placing the production of castings on a higher plane of control, thus permitting castings to be produced with better physical properties and reducing the percentage of defects.

A non-ferrous program, the most ambitious and extensive ever attempted at an A.F.A. convention, will be a noteworthy feature this year. This will include (a) a shop-operation course of three distinct sessions devoted to gating problems, (b) a round-table discussion group, (c) a session on non-ferrous cost methods, and (d) two sessions on plant and metallurgical methods.

A partial list of papers which are scheduled for presentation and discussion at various convention sessions are given below:

Foundry Costs

Weak Points in Cost Systems Which Permit Leakages, by E. A. Baker, Ellery A. Baker and Company, New York.

Report of Committee on Required Estimating Data.

Report of Committee on Methods for Estimating Molding Costs.

Apprentice Training

Getting a Community Apprenticeship Program Under Way, by H. S. Falk, Falk Corporation, Milwaukee, Wis.

Related Instruction, by S. M. Brah, Tri-City Manufacturers' Association, Moline, Ill.

Sand Research and Control

Effect of Heat on the Permeability of Facing and Core Sands, by W. M. Saunders, Providence, R. I.

Shape of Sand Grains, by Dr. H. Ries and G. D. Conant, Cornell University, Ithaca, N. Y.

Some Observations on the Use of Synthetic Sands, by L. B. Knight, National Engineering Company, Chicago.

Relation Between Sand Grains and Strength of Sands, by Dr. H. Ries and H. V. Lee, Cornell University, Ithaca, N. Y.

Non-ferrous Foundry Practice

Deep Etching of Brass as Applied to Gating Problems, by R. W. Parsons, Ohio Brass Company, Mansfield, Ohio.

Cupola Melting of Brass, by T. Mauland, International Harvester Company, Chicago, Ill.

Permanent-Mold Foundry Practice for Brass and Bronze Castings, by Henri Marius, Lenoir Car Works, Lenoir City, Tenn.

Molding Practice for Heat-Treated Aluminum-Alloy Castings, by L. H. Fawcett, U. S. Naval Gun Factory, Washington, D. C.

The X-Ray as a Tool for Improving Aluminum-Alloy Foundry Practice, by H. J. Rowe and E. M. Gingerich, Aluminum Company of America, Cleveland, Ohio.

Bronze Pressure Castings, by J. E. Crown, U. S. Naval Gun Factory, Washington, D. C.

International Foundry Congresses

The International Foundry Exhibition and Congress for 1931 will be held in Milan, Italy, in September of that year. Paris, France, will be the scene of the following international foundrymen's congress which by arrangement of the Association Technique de Fonderie de France will be held September 14 to 20, 1932.

Sound of Metals

Q.—Can you give me any information on the sounding qualities of metals?

A.—In general, the quality of a metal which causes it to give forth a resonant sound when it is struck or vibrated depends upon its hardness and resilience. In order to obtain a maximum result the metal should be so treated or worked as to make it very hard, so that the elastic limit is very nearly equal to the ultimate tensile strength.

Where no tempering or cold working is possib'e, as for example in the case of a large bell, a similar result is obtained by casting the metal from an alloy which is naturally very hard and resilient. For bells a high tin-bronze is commonly used, 75% to 80% copper, 25% to 20% tin. This alloy is too hard and brittle for most purposes but, in a properly designed bell it has a beautiful tone. Because of its brittleness it is very subject to cracking and a number of famous bells have cracked in service or, sometimes, without ever having been used. A bronze lower in tin which has been work hardened by drawing it into the desired shape also has a pleasing tone.

H. M. St. John.

The Scientific Production of Non-Ferrous Ingots

By WALTER H. JACOBSON and WILLIAM KELLY

Metallurgist and Superintendent of the Red Metal Department, and Research Engineer, Respectively, of the Tottenville Copper Company, Inc., Tottenville, N. Y.

An Explanation of the Advantages of Ingot Over Virgin Metals or Scrap—The Need for Research and Controlled Production Methods

THE Non-Ferrous Metal Ingot Institute comprising the leading manufacturers of brass and bronze ingots in the United States, recently adopted specifications covering the manufacture of non-ferrous ingots.* These specifications were drawn up jointly by Committees from the American Society of Testing Materials and the Institute, and cover fifteen of the most prominent compositions. Limits are placed on the copper, tin, lead and zinc and such impurities as phosphorous, sulphur, iron, antimony, silicon and nickel. Table I is taken from the specifications. Without question this is the most important advance ever made by the ingot producers. It proves that the manufacturer realizes the importance of a high grade material and that he has self-imposed limits on the impurities in his product. A great amount of time and effort was expended by the Committee in the selection of the fifteen compositions. Hundreds of miscellaneous specifications have been reduced to this small number. The Committee is to be highly commended for its efforts and it is hoped that the consumers of ingot metal will cooperate by using, wherever possible, one of these compositions.

The manufacture of brass and bronze ingots from secondary materials started many years ago in small plants where scrap was melted down in small furnaces. No attempt was made to refine the metal, and the compositions varied within wide limits. No effort was made to keep the impurities below any fixed value. Neither the manufacturer nor the purchaser maintained a chemical laboratory to check the compositions. From this humble beginning the industry has grown to its present position.

There are now several large refineries where scrap of every variety, shape and composition is refined. The metal is purchased on chemical composition, is refined under careful chemical and metallurgical control and is alloyed into ingots the constituents of which are guaranteed within narrow limits.

This is the age of research and development, and probably in no other branch of industry has greater progress been made in the improvement of both the methods of manufacture and quality of the product, than in secondary metals. No longer is the manufacture of bronze ingots just a remelting process. The metallurgy of secondary materials in some respects is more difficult than that of virgin metals.

Non-ferrous castings are made either from ingot metals, virgin metals, scrap metal or combination of the above.

Advantages of Ingot Metals Over Virgin Metals

The amount of ingot metal consumed has increased steadily each year, and more and more foundries are being won over to the use of ingots. Those who have only used virgin metal, under the erroneous impression that

* For a list of these specifications see THE METAL INDUSTRY for October, 1930, pages 479-480.

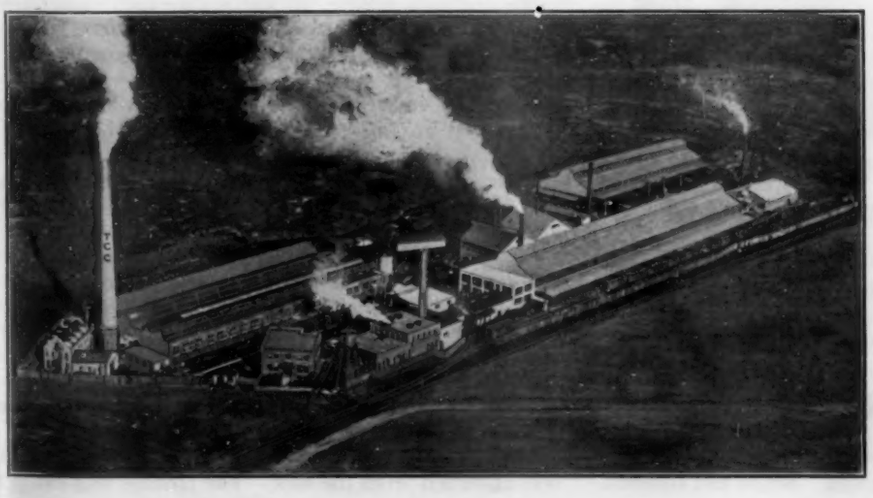


Fig. 1—Plant of the Tottenville Copper Company at Tottenville, Staten Island, New York

TABLE I.—CHEMICAL COMPOSITIONS OF COPPER BASE ALLOYS

Alloy	Copper, per cent	Lead, per cent	Tin, per cent	Zinc per cent	Impurities, maximum, per cent: Anti-mony	Iron	Nickel	Phos-phorus	Sulfur	Alumi-num	Silicon	Total Constituents, per cent: 1*	2†
No. 1..	Remainder	1.50 to 2.50	9 to 11	1.50 to 2.50	0.25	0.25	0.50	0.03	0.08	0.005	0.05	0.50	....
No. 2..	Remainder	1.50 to 2.50	7.25 to 8.75	3.50 to 4.50	0.25	0.25	0.50	0.03	0.08	0.005	0.05	0.50	....
No. 3..	Remainder	4.25 to 5.75	5.25 to 6.75	2.50 to 3.50	0.25	0.25	0.50	0.03	0.08	0.005	0.05	0.50	....
No. 4..	Remainder	4.25 to 5.75	4.25 to 5.75	4.25 to 5.75	0.25	0.25	0.50	0.03	0.08	0.005	0.05	0.50	....
No. 5..	Remainder	4.25 to 5.75	3.25 to 4.75	9 to 11	0.25	0.35	0.50	0.03	0.08	0.005	0.05	0.50	....
No. 6..	Remainder	7 to 9	2.50 to 3.50	8.50 to 11.50	0.25	0.35	0.50	0.03	0.08	0.005	0.03	0.50	....
No. 7..	Remainder	9 to 11	9 to 11	1.00[a]	1.00	0.25	0.50	0.05	0.08	0.005	0.03	....	0.50
No. 8..	Remainder	9 to 11	9 to 11	2.00[a]	1.00	0.25	0.50	0.05	0.08	0.005	0.03	....	0.50
No. 9..	Remainder	13.50 to 16.50	7 to 9	2.00[a]	1.00	0.25	0.50	0.05	0.08	0.005	0.03	....	0.50
No. 10.	Remainder	18 to 22	5.25 to 6.75	1.50[a]	1.00	0.25	0.50	0.05	0.08	0.005	0.03	....	0.50
No. 11.	Remainder	14 to 20	3.50 to 5.50	4 to 6	1.00	0.25	0.50	0.05	0.08	0.005	0.03	....	0.50
No. 12.	70 to 75	1 to 4	2.00[a]	Remainder	0.10	0.25	0.50	0.01	0.05	0.005	0.10	0.50	....
No. 13.	67 to 70	1 to 4	1.50[a]	Remainder	0.10	0.30	0.50	0.01	0.05	0.005	0.10	0.55	....
No. 14.	64 to 67	1 to 3	1.00[a]	Remainder	0.10	0.35	0.50	0.01	0.05	0.005	0.10	0.60	....
No. 15.	60[b]	3.00[a]	1.00[a]	Remainder	0.10	0.35	0.50	0.01	0.05	0.50	0.10	1.00	....

[a] maximum. [b] minimum.
*Other than copper, lead, tin, zinc and nickel.
†Other than copper, lead, tin, zinc, nickel and antimony.

nothing else would produce good results in the castings, have found that ingot metals, when given a fair trial, have quickly proven this a fallacy.

Valves, meters, fittings, gears, pump casings, impellers, centrifugal castings, in fact practically all types of castings, whether pressure or just plain machinery castings, varying in weights from a few ounces to several thousand pounds, are successfully cast from ingot metals.

The use of ingot metal has the following advantages over virgin metal:

1.—Perfect alloying of the constituents is assured due to the method of manufacture. Many foundrymen who use virgin metals, have found that it is necessary to cast metal into ingots and re-melt the ingots in order to insure a homogeneous composition. As a matter of fact, most alloys produce better castings upon the second melting.

2.—Less heat is required to melt ingot metal since the copper-base alloy has a lower melting point than copper. When using virgin metals enough heat must be supplied to first melt down the copper.

3.—There is less chance for error in composition, due to a mistake in weighing, since with ingots the wrong weight means only a little more or less of an alloy. This is especially important if castings are being manufactured to a guaranteed analysis, since a mistake in weighing, and consequently a mistake in composition, will not be discovered until after the castings are poured, and possibly until some machine work has been done upon them.

4.—With the use of ingots, a better control of the melting and pouring temperature is possible, since it is necessary only to heat to a pre-determined temperature and pour. When using new metals, such a high temperature is required to melt copper that even after adding the white metals to the mixture, and removing it from the fire, the addition of cooling metal is often required.

5.—Another point that must be carefully guarded against when melting virgin metals, is to melt the copper very carefully to prevent either oxidation or the absorption of gases. Molten copper is very susceptible to gas absorption, and unless a proper cover is provided and the greatest care is exercised in melting, the alloy may be ruined.

6. Last but not least, a distinct saving in price can be realized by the use of ingots. Competition these days is so keen that the difference in price between virgin metal and ingot metal represents the difference between a profit and a loss.

Advantages of Ingot Metal Over Scrap

The use of outside scrap metal of unknown origin in the foundry, is extremely dangerous. Brass and composition scrap metals, even after sorting with great care, vary within fairly wide limits, and when used in small quantities, may show a considerable variation in composition of the castings.

The secondary refiner is an economic necessity in handling metallic waste materials and converting them into scientifically alloyed ingot compositions that meet all the requirements of virgin metals. Due to unsettled market conditions some foundries have resorted to the use of composition and brass scrap for the purpose of cutting down the cost of production. Aside from not being in a position to produce a uniform quality of castings, the users of such scrap were unaware of the many difficulties and troubles to be encountered, besides the resulting financial loss. In other words, the differential between the cost of scrap and ingot turned out to be much less than between the cost of producing castings from scrap and that from ingot. The problems arising from such operation have been of special interest. A manufacturer of hardware reported a condition of twenty per cent loss of castings to be chromium plated or lacquered. These defects were brought to our attention. After a very thorough microscopical examination, discolored areas on the surface of the casting were noted indicating copper sulphide inclusions, the tendency of which was to form a defective, porous network structure. Such open and irregular cavities could not be covered by plating. Lacquering exaggerated the condition due to the spotting out of a greenish blue compound resulting from the chemical action of cuprous sulphide with the lacquer. When the metal was melted in an oxidizing atmosphere the defective structure covered large areas and was of a more complex nature, probably due to a combination of zinc oxide and cuprous sulphide in solution. These difficulties have been removed by the substitution of ingot metal for scrap.

Another interesting problem was brought to our laboratory for investigation—a case where a foundry produced castings by melting scrap and turnings in an electric furnace and endeavored to refine them with a flux, the purpose evidently being to remove iron, aluminum and phosphorous. No doubt very small percentages of these elements may be eliminated by fluxing methods, but in this particular instance the matter became worse. The metal was sluggish, the castings showed a greyish color; the risers were smooth with a black-grey appearance indicating the presence of silicon. Under pressure the casting leaked, showing a porous structure. The absorption of silicon resulted from the flux attacking the carborundum lining in a reducing atmosphere. The sluggishness was due to a presence of excess sulphur that was absorbed from the flux. The trouble was exaggerated

by pouring at too high a temperature. In this particular foundry soda ash was added to the ladle before pouring, with the intention of eliminating sulphur. This method of removing sulphur is of little value since very little, if any, reacts with the soda ash. We have definitely proved that in brass or composition, sulphur is not removed with this chemical compound so long as tin, lead and zinc are present with the copper as is always the

Fig. 2—Experimental Foundry at Tottenville Copper Plant

case. This foundry has also gone back to ingot. Costs are lower and many heartaches have been eliminated.

The Need for Research

Industrial requirements have demanded better alloys to be manufactured from secondary metals; in other words, alloys equal to virgin metals. To attain this end considerable research has been in progress in the modern ingot industry. A thorough study of the elements, impurities and conditions affecting the structure and physical properties of the metal requires the services of competent metallurgists. Problems for scientific investigation arise not only within the realms of the ingot producer but also within the foundry and plant of the metal consumer.

For many years ingot was purchased according to chemical analysis and was accepted or rejected on that score. Manufacturers and consumers were at a loss to understand why one lot of ingot worked satisfactorily in the field and the next one failed, especially when both showed by chemical analysis the necessary percentages of the elements complying with specifications. Heretofore fracture and examination of machined surface were the chief practical tests revealing the character of the metal. It is true that this method of examination has proved to be very successful within certain limits. However, the high quality ingot and the resulting sound casting from them are the fruits of close metallurgical control together with microscopical and macroscopical investigation. The latter method of examination detects the differences in crystalline structure with special reference to zones of weakness and non-metallic inclusions, together with any possible segregation. The elimination of absorbed gases around the grain boundaries has been a fertile field for research and has solved the task of attaining a uniformly tight texture in the alloy structure capable of withstanding high pressures. Under certain conditions very minute percentages of certain elements tend to promote this tight crystalline structure by having a marked affinity for such inclusions.

The manufacture of ingots necessitates the carrying of large metal stocks usually named under at least one hundred classifications, including the varied copper bearing materials. A large portion of this stock is carefully concentrated, graded, magneted to remove the free iron, cleaned, briquetted and stored under close supervision. Recently developed methods of cleaning turnings and similar material from aluminum and babbitt chips, prior to charging them into the furnace for the production of ingot, seem to be very advantageous. Experimental work in removing lead from the varied, scrap metals so as to obtain a large volume of low lead composition scrap is working out very favorably. Accordingly, steps have been taken to install processes for scrap treatment preliminary to the main reverberatory operation. Composition ingot is manufactured in reverberatory furnaces of carload capacity with metallurgical and chemical control insuring uniformity and flexibility of operation. The aims of efficient furnace operation are twofold—the production of a high grade alloy and lowering the costs of manufacturing.

Research work has carried ingot makers into the complete analysis of foundry melting atmospheres and their effect on the resulting castings. They have developed processes for the production of ingots such that the resulting ingot is best adapted to general foundry practice. The tendency toward the formation of catalytic slags resisting the absorption of zinc oxide and being slightly reducing is a factor toward lowering metal losses.

Figure 2 shows a view of the experimental foundry of the plant with which the writers of this article are connected. Here various researches are carried out in connection with the development of new alloys and the determination of their adaptability for various classes of castings. After all, the final proof of any composition is its satisfactory casting properties. A good technical staff is always willing to recommend the proper alloy for any particular casting, and their recommendations are backed up by actual tests in the foundry. The foundry also permits us to determine the actual physical properties of sand cast and chill cast test bars in connection with any lot of ingots. Of course, the very best material in the world may be ruined by improper handling and melting in the foundry. Furthermore, it is the most natural thing for a foundryman, when he is having trouble, to place the blame on the metal. However, a good cast-

Fig. 3—Corner of Chemical Laboratory at the Tottenville Plant

ing made from this same metal is the most convincing argument that his trouble is elsewhere.

Figure 3 shows a view of our chemical laboratory. As the production today of good ingot metal is almost an exact science, competent chemists are required to analyze raw and finished materials and to make several control analyses of every heat. It is due to the exact methods of manufacture and the research work that have been carried out in connection therewith, that the ingot business today is in a healthier position than ever before.

Lead "Burning" or Welding

By FRANCIS A. WESTBROOK
Mechanical Engineer

A Detailed Description of the Methods in Modern Practice as Given by F. E. Rogers of the Applied Engineering Department, Air Reduction Company, New York, and G. Stannard Owen, Special Representative of the National Lead Company, New York

THE art of welding or lead "burning," as it is called, is steadily becoming more and more important due to the rapidly increasing use of lead in a variety of industries. These industries embrace acid plants, industrial chemical plants, oil refineries, artificial silk plants, electrolytic copper and zinc plants, fertilizer plants, powder and nitro-glycerine works, soap factories, and electroplating works and various plants employing the use of corrosive acids.

Lead "burning," so-called, is a misnomer, as the metal is not burned, but welded the same as other metals such as iron, steel, etc., the difference being in the method. There is no solder or flux used and the only filler is chemical lead or antimonial lead of the same percentage as of the sheet or pipe.

The widespread use of electric storage battery starting and lighting systems on motor cars, trucks, and pullman cars has created a demand in battery manufacturing plants, garages, and battery service stations for lead-burning equipment, which is used in welding the lead plate connectors and terminals.

On account, therefore, of the expanding volume of this practice, especially as applied to chemical, acid plants, pipe lines, etc., it is felt that the following notes on what constitutes successful procedure are in order.

As all lead installations mean quite an outlay of money and as the employees' lives often depend entirely upon the correct installation, care must be exercised in the proper selection of the sheet lead and pipe used for the purpose in hand.

Chemical lead is defined as that smelted from Southeast Missouri ores by the St. Joseph Lead Company. The trade name is "St. Joe Sheet Lead" or "Pipe." Its use assures the greatest acid resistance of any lead sheet. This lead is used for general chemical and acid plant work.

Antimonial sheet lead is an alloy of chemical lead and antimony in various percentages, according to strength necessary. It is used especially in cold tanks, the pipe being used extensively for steam coils, etc. This type of lead has from 4 to 10% antimony. With 6% antimony it has twice the tensile strength of chemical lead and five times the elastic limit. The alloy is also lighter than chemical sheet lead in the following proportions:

6% antimony alloy is 5% lighter than chemical sheet.
8% antimony alloy is 6½% lighter than chemical sheet.
10% antimony alloy is 8% lighter than chemical sheet.

The following is a further comparison of physical properties of chemical lead and 6% antimonial lead alloy from which 6% metal sheet and pipe are made:

Chemical Lead		6% Antimonial Lead Alloy
709.7	Weight per cu. ft.	674.2
327° C	Melting point	253 C
608° F	Melting point	487 F
1,900 lbs. sq. in.	Tensile strength	3,625 lbs. per sq. in.
	10%	4,030 lbs. per sq. in.
700 lbs.	Elastic limit	3,000 lbs. per sq. in.
11.254 to 11.395	Specific gravity	10.692 to 10.820

Crawlproof lead is a reinforced sheet lead. It is chemical sheet lead reinforced with antimonial lead bars, running the length of the sheet, much as steel bars reinforce concrete structures. This is an exceptionally fine lead for high temperatures and for deep tanks when great tensile strength is required.

Soft sheet lead, pure lead, or Trade lead is usually made from Omaha Desilverized lead or other brands which do not have the proper acid resistance and are, therefore, unfit for chemical or acid purposes.

Cleaning, Preparation and Joints

Considerable skill is required to burn or weld sheet lead rapidly and uniformly. The beginner is likely to overheat and burn holes in the joint, to say nothing of his difficulties in making welds that measure up to the standard of lead work. It is not an easily learned trade, but if an intelligent workman provides himself with the proper equipment and competent instruction, it is quickly learned. Success depends on thorough preparation, clean surfaces, suitable gases and equipment, proper lead and patience.

There are two standard seams used in sheet lead work, the butt seam and lap seam. Fig. 1 shows how the edges are prepared. In burning a butt seam, the sheets are left about one-eighth to one-quarter of an inch apart. The sides of the sheets are then scraped clean of oxide, about one-half inch from the edges, using what is called a "shave

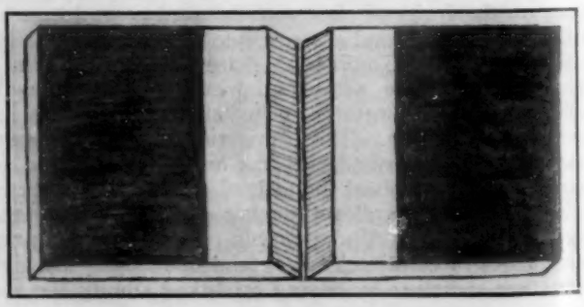


Fig. 1—Beveled Lead Sheets Ready for Welding

hook." Fig. 2 shows the edges scraped for a butt weld. The edges are then "tacked" together with the flame. It is now ready for welding. Burning Bar (filler bar) is used to fill the crack left between sheets and the seam is slightly higher than the sheets when finished. This is

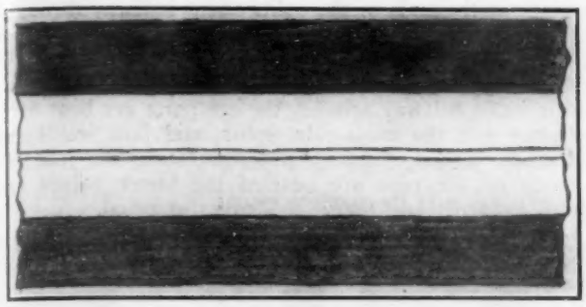


Fig. 2—Lead Sheets with Edges Scraped for Butt Weld

done by applying the flame to the burning bar and sheet at the same time as in Fig. 3. The result will be as in Fig. 4.

Estimate the amount of burning three-eights inch in diameter required as one foot of bar to one foot of seam in 10 lb. lead, or in that proportion.

In the heavier weights of sheet lead—from 16 lb. per square foot—the edges should be beveled to an angle of 75 to 80 degrees, making a vee of about 30 degrees included angle when the two sheets are butted. You then proceed with the burning.

Lap seams are used more extensively than butt seams, especially in the vertical joints, and when a smooth surface is not required. In making a lap seam the top sheet should lap the under sheet about one inch to two inches. In the flat lap seam scrape the same as in the butt seam. It is also burned the same as the butt seam, adding enough burning bar to build up the under sheet a little higher than the top.

In the vertical seam the top of the under sheet and the under side, top side, and edge of the top sheet must be cleaned and scraped very carefully. In burning upright or vertical seams, also overhead and under hand seams, the workman cannot be too careful in preparing and cleaning the lead properly. As no burning bar is used in these

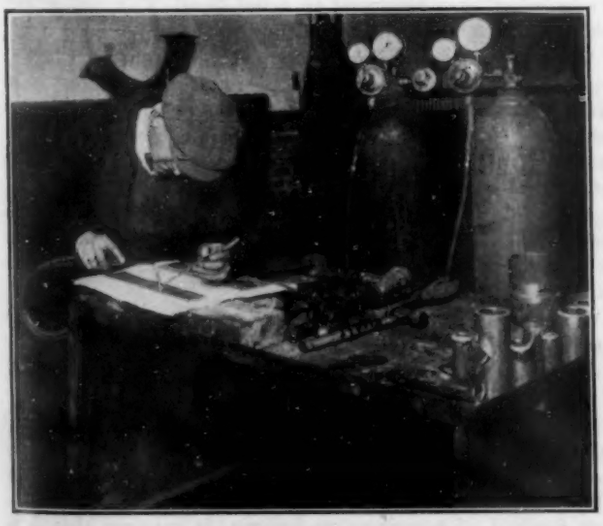


Fig. 3—Making a Reinforced Ripple Butt Weld Level Seam, in 8 lb. Lead. Oxycalorene Flame. Sheet Asbestos Beneath the Lead to Retain the Heat.

types of seams, the loss of a drop of lead means an irregular seam and oxidation and sometimes means starting all over with loss of time, etc.

As no burning bar is used on vertical seams, the flame is applied to the edge of the top sheet as in Fig. 5. The lead from the top sheet is brought down and over to the under side. The lead burner uses a shave hook to keep the proper space between the sheets and to help chill the lead.

Torches and Gases

The heat required for lead burning is low in comparison with that used in welding iron and steel, being about 625 degrees F. to 700 degrees F. That is, the fusion temperature is only about one-fourth as high. However, if a high-temperature gas is employed, a smaller tip is used than with hydrogen. Small, light torches are used that can be easily handled. Old-time lead burners were trained to use hydrogen and compressed air, but the introduction of oxy-acetylene welding equipment and compressed oxygen, acetylene and calorene in convenient cylinders is changing lead burning practice, especially in the heavier leads. Calorene is highly efficient for the purpose, the flame being easily controlled and adjusted because of its slight endothermic characteristic, producing a visible cone or flame. The flame cone is not visible with oxygen and heat is more broadly spread. The lead burner necessarily

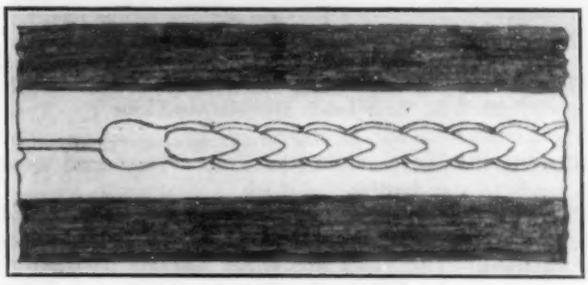


Fig. 4—Butt Reinforced Weld in 4-Pound Sheet. Ripple Space, 7/16 in.

becomes expert in working lead within narrow temperatures.

The first operation to be learned is to choose the right sized tip and to regulate the flame. The volume of heat and size tip required will depend upon the thickness of the lead and to some extent on the surrounding conditions and backing.

In relining old tanks or boxes constructed of wood, care must be used to see that all parts have been dried or the acid neutralized. This can be done either by the use of marble dust, lime, etc. As some of the acid will have soaked into the wood, it is good practice to place a strip of asbestos under the seam to insure against the acid or liquid from bubbling through while burning. As gases are formed under these conditions, the burner must watch his seams as he progresses, as air bubbles are sometimes formed and leave a weak spot in the seam. Where iron tanks are being relined it is an easy matter to dry up the acids by use of an alkali dust. In patching a tank where it is impracticable to entirely empty it, the acid may be dammed back by use of wet asbestos or clay, preferably clay.

As sheet lead comes in various thicknesses, weighing from two to sixty pounds per square foot, it is quite apparent that the lead burner must be able to regulate his flame and use the correct tip. A lead burner of long experience, foreman of his department, is shown using an Airco Style C torch with a number 2 tip. He would use this tip on 2 lb., 4 lb., 6 lb. and 8 lb. lead. A number

4 tip would be used on the same torch for 10, 12 and 20 lb. lead.

The Airco-D-B Style 8900 torch, employing oxygen and acetylene, is used with tips number 1 and 2 on heavy lead ranging from 24 lb. to 60 lb. per square foot.

The use of 2 lb. and 4 lb. lead in acid and chemical plants is negligible. Therefore, the selection of the proper weight of burning bar is easily decided. Three-eights inch bar is recommended for 6 lb. to 10 lb. and

Fig. 5—Making a Vertical Lap Weld, Using no Filling Rod, with 6 lb. Sheet Lead; Oxycalorene Flame

one-half inch bar from 10 lb. to 60 lb. This small selection tends to standardize the stock.

The wiped or soldered joints in pipe work used in acid, chemical plants, etc., are very unsatisfactory and are seldom used. The pipes are either burned together or flanges are used. Where the outside of the pipe comes into contact with acids and chemicals, a burned joint is used exclusively. In other lines the flange is ordinarily used, due to the fact that it lowers construction cost and is easily replaced. In the burning of all pipe connections it is necessary to use burning bar, as all joints must be as strong as the pipe itself. This can only be done by adding extra lead to the joint. The following joints are used in lead pipe work: roll, cup, butt, split and flanged. In the use of cast iron, wrought iron, or brass flanges, the flange is cut out so that it will slip over the pipe easily. The end of the pipe is then dressed over the flange. No burning is required.

Often in the maze of lead pipes in a chemical plant, some are so laid that the underside is inaccessible for burning. When it becomes necessary to replace a section and burn it in with butt joints, heavy expense would be incurred for removing and replacing the underneath obstruction, or cutting several side connections and re-burning.

In cases like these, the pipe ends are split back at the top from two to six inches, depending on size. Cross cuts are made at the ends of the splits about halfway through, as shown in Fig. 6. The split parts are bent outward, thus exposing the inside and permitting the underside of the weld to be made on the inside of the pipe. When the weld is made halfway around, the cut parts are bent back into place and the cross-cuts, splits, and butt welds are then made, closing the pipe and completing the job. If the ends of the pipe are beveled the lower halves are beveled inwardly and the upper halves as usual.

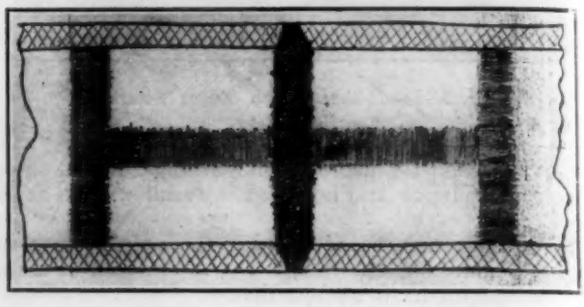


Fig. 6—Split Lead Joint in 2-in. Inside Diameter Extra Strong Lead Pipe. Bottom Welded from Inside of Pipe. Light Lines Show Split Welds.

Unless a lead burner has worked on chemical plant construction or maintenance lead work, the chances are that he is far from familiar with lead burning as found in chemical plants. The literature on lead burning of the chemical plant type is scarce and the little available is incorrect in many particulars. Lead-lined iron tanks, wood vats and concrete tanks have different styles of seams or different uses, and the lead burner must know his job and exercise care to have them lined to withstand the use to which they are to be put.

LEAD PIPE SIZES USED IN CHEMICAL PLANTS

Inside Diam.	Weight per ft. Lbs.	Weight per ft. Ozs.	Thickness of Wall	Outside Diam.
⅛"	0	4	1/16"	11/32"
¼"	0	8	3/32"	7/16"
⅜"	1	9	11/64"	23/32"
½"	2	1	5/32"	11/16"
¾"	3	0	13/64"	1 5/32"
1"	4	0	7/32"	1 7/16"
1¼"	4	12	7/32"	1 43/64"
1½"	6	8	¼"	2"
2"	9	0	¼"	2½"
3"	12	8	¼"	3½"
4"	16	12	¼"	4½"
6"	24	0	5/16"	6 11/16"

Casting Pewter Slabs

Q.—I am mailing under separate cover a sample of pewter which has been cast in a flat mold, 9" x 12" x ¾" thick.

We are experiencing trouble with small blisters appearing on the surface from the gate end to about one-third of the way back on the top surface, after the plate has been rolled to ½" or ⅜" thick. We would appreciate any information you can give us on the cause and elimination of this blistered surface.

A.—We do not know in what angle or position you have poured this mold. However, the sample appears to have air trapped in the casting of the slab and these air pockets show up as blisters.

We suggest that you pour slab on an angle of about 30 degrees, letting the metal slide into the mold, and as the mold is filled up raise the mold to a vertical position and fill up.

If you are pouring in an open mold we suggest pouring on an incline making the metal run up hill. Not knowing the type of mold you are using we are trying to tell you how to overcome these air pockets. At any rate, your method of pouring, we believe, is causing this difficulty, so we suggest you arrange your mold so that when you pour the metal it will not trap air.

W. J. Reardon.

A New Silicon-Zinc-Copper Alloy

By DR. E. VADERS

Hirsch, Kupfer- und Messingwerke A.-G., Finow (Mark), Germany.

The Use of Silicon as a Deoxidizer and Alloying Agent—Preparation of the Alloys—Determination of Solid Solubility Limits — Mechanical and Physical Properties — Part 2*

PAPER READ AT THE MEETING OF THE (BRITISH) INSTITUTE OF METALS, AT SOUTHAMPTON, ENGLAND, SEPTEMBER 12, 1930

TAKING a general view of line *ab* in Fig. 1,* it will be noticed that the formation of a second phase (whether a new solid solution or a compound) takes place at lower silicon contents as zinc content increases.

When the alloys contain 20 per cent or more zinc the curve *ab* falls rapidly to very small values for silicon. All alloys lying appreciably to the right of this line are brittle and therefore technically useless, but a few alloys, the composition of which is just over the border-line, are quite useful—e.g. the 5:10:85 and 5:14:81 silicon-zinc-copper alloys. The brittle alloys will not be considered in this paper, which deals solely with those silicon-zinc-copper alloys that can be used industrially. Moreover, the theoretical interpretation of the thermal analysis curves and the microstructure of these alloys is very difficult, owing to the complicated nature of the copper-zinc and copper-silicon diagrams, and to the fact that nothing is known yet of the silicon-zinc system. Again, alloys with a high silicon content can be produced only with difficulty, if at all, owing to the volatility of zinc and the high melting point of silicon. Nevertheless, the author hopes in the future to work out as far as possible the equilibrium diagram of the ternary system and confirm and amplify the results which he has already obtained for physical and structural properties of the technically useful alloys.

SOME PHYSICAL AND MECHANICAL PROPERTIES OF SILICON-ZINC-COPPER ALLOYS, AND NOTES ON THEIR TECHNICAL APPLICATIONS

Melting Point

The melting points of a few of the alloys with more than 86 per cent copper and consisting of homogeneous α solid solution are recorded in Table III:

TABLE III.

Composition. Per cent (not Analyzed) Copper	Silicon	Zinc	Solidification commences at ° C
95	5	..	995
84	4	12	920
86	4	10	950
87	3	10	980
88	4	8	970
90	2	8	1031
90	..	10	1045

It will be seen that the melting point has a tendency to fall whether zinc or silicon is added, the lowest melting point occurring with the alloy having the highest silicon and the highest zinc content. Increase of silicon lowers the melting point to a greater extent than a corresponding increase in the zinc content.

* Part 1 appeared in the issue for March, 1931, pages 108-110, where Figs. 1 to 14 and Tables I and II appeared.

Specific Gravity

Table IV records the density of some of the alloys.

From these figures it will be noticed that alloys with the highest silicon content, the zinc content being constant, have the lowest specific gravity. It may be assumed that there is a simple relation between the specific gravity of ternary solid solutions and the specific gravity of the constituents such as holds good for binary alloys. The calculated specific gravities, however, show slight deviations, probably due to errors in the analysis; also the alloys contained 0.1-0.3 per cent iron. The test-pieces on which determinations of the specific gravity were made were cut from rods cast in chill moulds.

TABLE IV.

Composition (by Analysis). Per Cent. Copper	Silicon	Zinc	Density Grm./c.c.
75.16	3.72	Remainder	7.85
81.28	2.78	"	8.05
67.16	1.71	"	7.98
81.92	3.01	"	8.01
78.03	2.11	"	8.13
90.0	Nil	10	8.66

THE TENSILE PROPERTIES OF SILICON-ZINC-COPPER ALLOYS

Cast Alloys

The figures already given in Table II* for sand-cast alloys shows that silicon-zinc-copper alloys have a high tensile strength and a reasonable ductility. The values shown for alloy 3 in Table II are particularly noteworthy, when it is remembered that the usual tin-copper alloys used for casting purposes rarely have a tensile strength exceeding 25 kg./mm.²

The difference in the elongations of alloys 6 and 7 is remarkable; an increase of 3 per cent in the zinc content has reduced the elongation from 11 to 2 per cent. This behavior is explained by referring to the position of these alloys with reference to the line *ab* in Fig. 1; alloy 7 is just on this line, and alloy 6 well to the right of it.

From the results given in Tables V and VI it is seen that these alloys possess tensile properties which should make them technically valuable. Especially useful both for sand- and chill-castings should be the alloys with 70-90 per cent copper, some of which in the cast state have a tensile strength exceeding 55 kg./mm.², and others have

an elongation of 40-50 per cent; such alloys can readily be rolled and drawn whereby their properties attain values far superior to those of any of the usual zinc-copper alloys.

The figures in Table VI show clearly the effect on the mechanical properties of the alloys of the separation of the new silicon-rich constituent. When the boundary line of solubility is overstepped a discontinuity occurs in the dependence of the values of tensile strength, elongation, and hardness on the silicon content. Fig. 15 shows the results of Table VI graphically; curves *a*, *b*, and *c* are for alloys with 14 per cent zinc, and a′, b′, c′ for alloys with 30 per cent zinc. In the first case a sudden rise in hardness and tensile strength and a decrease in ductility occur between 3 and 4 per cent silicon, and in the second case the increase in tensile strength and the decrease in ductility are more marked between 0 and 1 per cent silicon than between 2 and 3 per cent silicon; this is what would be expected by referring to the course of the line *ab* in Fig. 1.* With the separation of the new constituent the ductility of alloys with more than 70 per cent copper rapidly diminishes, but the hardness and strength increase.

TABLE V—SAND-CAST SPECIMENS OF SILICON-ZINC-COPPER ALLOYS HAVING A CROSS-SECTION 10 × 6 MM.

No.	Composition. Per cent (not Analyzed) Copper	Silicon	Zinc	Tensile Strength Kg./mm.²	Elongation Per Cent.	Brinell Hardness 10/1000/30
1	90	..	10	18.0	19	43
2	89	5	6	35.0	10	109
3	85	5	10	50.0	10	130
4	81	5	14	54.0	10	156
5	88	3	9	35.0	40	100
6	68	2	30	42.6	2	132
7	71	2	27	32.0	11	115
8	75	2	23	33.0	28	78
9	87	2	11	26.5	28	60

TABLE VI.—CHILL-CAST SPECIMENS OF SILICON-ZINC-COPPER ALLOYS HAVING A CROSS-SECTION 10 × 6 MM.

No.	Composition. Per cent (not Analyzed) Copper	Silicon	Zinc	Tensile Strength Kg./mm.²	Elongation Per Cent.	Brinell Hardness 10/1000/30
1	84	2	14	29.2	50.8	64
2	83	3	14	34.6	40.3	70
3	82	4	14	43.5	14.6	114
4	81	5	14	57.9	11.6	162
5	69	1	30	27.9	14.7	75
6	68	2	30	42.6	2.0	132
7	68	3	30	48.8	0.5	221

TABLE VII.—4:15:81 SILICON-ZINC-COPPER ALLOY EXTRUDED INTO RODS AND ANNEALED.

Rods Extruded at 15 mm. diameter	Tensile Strength Kg./mm.²	Elongation Per cent	Brinell Hardness 10/1000/30
Direct from the press.....	64.5	30.5	147.2
Annealed at 600° C. for 2 hrs.	64.1	20.1	148.2
" " 600° C. " 3 " .	65.4	23.5	160.3
" " 700° C. " 2 " .	61.8	26.0	166.5
" " 750° C. " 1 hr..	60.3	27.0	145.1

* See Part 1 of this article, pages 108-110, issue of March, 1931.

SILICON-ZINC-COPPER ALLOYS AS BEARING METALS

Whilst silicon-zinc-copper alloys decrease in strength and ductility by the addition of tin, due to the separation of a new hard constituent, their value as bearing alloys is thereby increased. Figs. 13* and 14* show the effect of tin on the microstructure. Fig. 13* refers to a drawn rod having a structure consisting of homogeneous solid solution, the crystals of which exhibit slip-planes. Fig. 14 shows the same alloy with 1 per cent tin; here the new hard crystals of bluish color are seen embedded in the crystals of the ground-mass. Similar crystal of δ-tin-copper alloy may be seen in the softer α ground-mass of tin-copper alloys containing more than 13.9 per cent tin. Experiments have shown that silicon-zinc-copper alloys, especially those with a small tin content, are valuable bearing metals; from the similarity of the structure of the alloy shown in Fig 14* with that of a tin bearing bronze, it would be inferred that the alloys should behave in a similar manner. Preliminary tests of some of the silicon-zinc-copper alloys containing a little tin have shown that they will withstand a specifically higher load as bearing metals than ordinary bronzes.

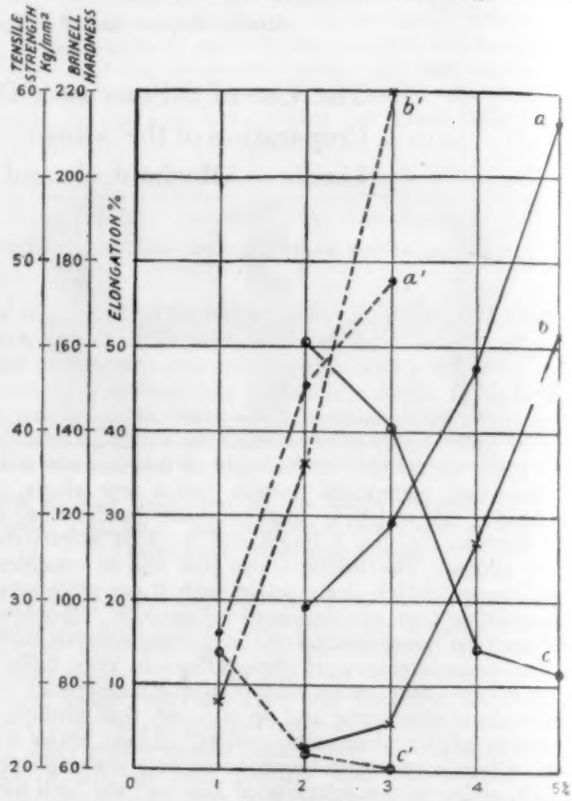


Figure 15

This article will be concluded in an early issue.—Ed.

Introduce New Alloy for Lead Pipe

Introduction of a new ternary alloy for lead pipe was recently announced by the British Non-Ferrous Metals Research Association. The new alloy is composed of 98.25 per cent lead, 1.5 per cent tin, and 0.25 per cent cadmium.

Greater tensile strength, reduced weight, and higher resistance to vibration, one of the most common causes of pipe bursts, as well as increased resistance to corrosion, are said to make this new pipe especially adaptable for water lines.

The use of the new pipe is gaining rapid headway in England, where, for instance, the city of Manchester is now specifying this type of pipe in all new water lines.

Testing Materials Society Meeting

Group Meeting of Committees Held at Hotel William Penn, Pittsburgh, Pa., March 16-20, 1931

THE annual Spring Group Meeting of Committees of the American Society for Testing Materials was held at the Hotel William Penn in Pittsburgh, March 16 to 20, inclusive. The committees met throughout all five days, starting with sessions in the morning and extending through the afternoon and evening with but one break on Wednesday evening.

In all, 23 committees of the Society took part, but with the many subcommittee meetings that were necessary the number of meetings held during these five days totalled approximately 115. About 500 were in attendance.

In addition a joint meeting was held of the Committee on Exposure Tests, composed of representatives of Committee A-5 and the American Electroplaters' Society.

The Group Meeting was held in conjunction with the Pittsburgh Regional Meeting, comprising a Symposium on Welding.

COMMITTEE B-6 ON DIE CAST METALS AND ALLOYS

At a meeting of the Subcommittee on Zinc Base Die Casting Alloys held in connection with the Group Meeting of the A.S.T.M. Committees in Pittsburgh—a committee under the chairmanship of W. H. Graves, Packard Motor Car Company, Detroit, Mich.—gave consideration to proposed specifications for Zinc-Base Alloy Die Castings. It is expected that these specifications will be submitted to the Society in June for publication as tentative.

Similar specifications for Aluminum-Base Alloy Die Castings and for the alloys used in such castings were recently developed by the sub-committee having jurisdiction over these specifications. These also will be submitted to the Society in June.

PROPOSED EXPOSURE TESTS OF ELECTROPLATED COATINGS

Plans have been made for a study of the protective value of electroplated coatings, to be conducted jointly by the American Electroplaters' Society, the American Society for Testing Materials and the Bureau of Standards. The detailed program of exposure tests was discussed at conferences in Chicago on January 16, 1931; and in Pittsburgh on March 17, 1931. The present program may be briefly summarized as follows:

The samples will consist of strip steel 4x6 inches, plated with zinc, cadmium, copper, nickel, chromium or combinations of these metals. All coatings will be of known and approximately uniform thickness and will be produced at the Bureau of Standards under defined conditions. Five samples of each kind will be exposed in each of six locations, namely, Sandy Hook, State College, Pittsburgh, Key West, and the Bell Laboratories in New York City; also the Bureau of Standards. Additional specimens will be simultaneously prepared for use in laboratory tests including stripping tests and accelerated exposures. About 7,000 specimens will be required in all, of which about 4,000 will be exposed.

The details of the tests and inspections will be in charge of a joint committee consisting at present of the following:

W. Blum, Chairman — L. H. Rovere
F. A. Hull — J. Hay
W. M. Phillips — P. Sievering
A. K. Graham

These tests are an extension of the present tests of plated coatings on hardware. It is believed that the results will be of considerable value to all those who produce or consume articles with electroplated coatings.

WELDING PROCESSES APPLICABLE TO ALUMINUM

By W. M. DUNLAP

Welding, which has been defined as a localized consolidation of metal parts by means of heat, has been divided into a number of processes; the basis for nomenclature depending upon the condition of the metal surface during the welding process, source of heat, medium of pressure, and so forth.

The author, in this paper, describes the various methods of gas and electric-arc welding applicable to aluminum and discusses the relative merits and uses of each with regard to the types of joint used and types of aluminum and alclad alloys welded. He also presents data on the mechanical and physical properties of the various types of welded joints.

Removing Sand From Aluminum Castings

Q.—We manufacture street markers of aluminum. These are circular and convex on top, the convexity amounting to one-half inch, and the diameter is 3¾ inches. We wish to devise some means of removing sand from tops of these castings.

It is possible that an endless emery belt might work. This could be renewed from time to time and would permit holding the casting against it in order to reach all points on the convex surface.

A.—We would suggest using an emery wheel such as used for buffing and polishing. Polishing and grinding supply and machinery houses advertising in our pages (see Buyers' Guide section) can supply you with all the equipment you need, as well as the method of operation.

A soft wheel can be renewed when the emery wears off. New emery is applied. W. J. REARDON.

British Institute of Metals Meeting

Synopses of Papers Presented at the Twenty-Third Annual General Meeting Held in London on March 11-12, 1931

The Corrosion of Early Chinese Bronzes, by W. F. Collins.

A series of objects, classified by their art-forms and ranging from the earliest known periods of the Chinese bronze age, has been analyzed and illustrated. The patina and patination deposits formed by their corrosion are stated to have resulted in formation of definite minerals. A list of minerals hitherto identified is given. Conditions leading to formation of such minerals based on analyses of the loess deposit in which Chinese bronzes are usually found, atmospheric conditions in China, and recent researches on corrosion of copper and bronze, are discussed. The Chinese bronzes are found to contain an unusually high percentage of lead. This preliminary research is stated to indicate that the bronze metallurgy of the early Chinese is distinct from that of the Sumerians.

A list of a considerable number of analyses of Chinese bronzes, collected from various sources, is appended.

An Investigation of the Microstructures of Fifteen Silver Greek Coins (500-300 B.C.) and Some Forgeries, by C. F. Elam.

The microstructure of a number of genuine ancient silver Greek coins is described, together with that of some forgeries. The structure varied considerably, although coins from the same mint and period resembled each other. All the genuine coins showed evidence of striking between dies as opposed to the forgeries, which, with one exception, were made by casting only. Analyses indicated that the coins were sometimes made from nearly pure silver, and sometimes copper was added. The forgeries contained copper, and in two cases, zinc.

The Mode of Deformation of a Single Crystal of Silver, by H. J. Gough and H. L. Cox.

A single crystal of silver has been tested under alternating torsional stresses with the especial object of studying the formation of twin bands. Throughout the tests, however, no definite twin markings were observed, although the surface of the specimen was covered by a complete system of slip-bands in good agreement with the maximum resolved shear stress law. After the specimen had been fractured in torsional fatigue, the test portion of the specimen (containing the crack) was annealed in vacuum with the object of revealing the presence of twins. No sign of twinning was, however, observed. After the completion of the torsional test, compression specimens were machined out of the enlarged ends of the torsion specimen. These specimens were compressed by static and impulsive forces, the maximum strain imposed being about 5 per cent. Again no twin markings were observed, although in every case profuse slip on the most highly stressed octahedral planes was produced.

The choice of silver as a suitable material for the study of the formation of twin bands under applied stress was made on the grounds that in the aggregate form silver is known to twin very readily. The complete failure to produce twins in the present experiments is, therefore, somewhat surprising; nevertheless this failure must be held to constitute a very important result as betraying an essential difference between the single crystal and the aggregate.

Some Properties of Metallic Cadmium, by C. H. M. Jenkins, with an Appendix on "X-Ray Investigation of Cold- and Hot-Rolled Cadmium," by G. D. Preston.

The physical properties of cadmium were investigated by means of tensile and ball hardness tests as well as by electrical conductivity measurements on "aged" and "heat-treated" material in the cast, forged, and rolled conditions. The research indicates that hardness changes on rolled material which are found to occur at room temperature are markedly affected by conditions of hot- or cold-working. By maintaining cadmium cold during rolling the material produced possesses properties markedly different from metal which is allowed to warm during this process. In the short-time tensile tests, worked material is found to be stronger than cast material, but under prolonged stress the cast alloys are inferior to rolled samples.

Microscopic examination was also undertaken on the various materials produced. In the cold-rolled condition the material appears to be completely recrystallized and of fine grain-size, but prolonged aging over a period of years results in appreciable grain growth. After slight straining the microstructure of cadmium is rendered complex, and full account must be taken of the effect of the methods of preparation of the specimen for this work.

The X-ray examination of samples of hot- and cold-worked cadmium does not indicate an allotropic modification at room temperature and ordinary pressures, but there are marked differences in properties which suggest a preferred orientation.

The Constitution of the Cadmium-Rich Alloys of the System Cadmium-Silver, by P. J. Durrant.

The constitution of the alloys of cadmium and silver from 0 to 40 per cent by weight of silver has been reinvestigated by the methods of thermal and micrographic analysis. The liquidus has been found to consist of four smooth curves which intersect with peritectic horizontals at 343°, 592°, and 640° C. In the solid state the system gives rise to the following solid solutions: "I," extending from 0 to 6 per cent by weight of silver; "II," extending from 18 to 33.5 per cent by weight of silver; "III," extending from 36.2 to 39 per cent by weight of silver. The solid solution "II" includes the two solid solutions which Petrenko and Federow described as ζ and δ. The solidus and liquidus of alloys of phase "II" are roughly parallel, and do not intersect, as was previously thought, at 25 atoms per cent of silver. No transformations below the solidus have been detected in any of the solid solutions, but the examination of solid solution "III" has not been carried out below 400° C.

The Solid Solutions of the Copper-Silver System, by D. Stockdale.

The mutual solubilities of copper and silver have been determined, chiefly by the method of examining quenched specimens under the microscope. As this method fails at low temperatures, further information about the position of the phase boundaries was sought by measuring the

electrical resistance of quenched wires. A "differential" method which shows up small, abrupt changes in the electrical resistance of alloys at the temperatures at which they occur is also described.

The diagram obtained differs in many respects from that usually found in the text-books, but it is in close agreement with two diagrams which have been published recently in Germany. The behaviour of standard silver when it is annealed is in conformity with the constitution of the alloys as it is now described.

The paper ends with a short summary of the results of other workers and a bibliography is appended.

A Note on the Silver-Rich Aluminium-Silver Alloys Above 600°C., by T. P. Hoar, and R. K. Rowntree.

An investigation of the silver-rich aluminium-silver alloys is described. Aluminium of high purity, and the combined use of thermal and micrographic analysis, make possible certain modifications in the previously existing diagram.

The Influence of Pressure and Temperature on the Extrusion of Metals, by C. E. Pearson and J. A. Smythe.

The paper describes experiments made in a small press on the extrusion-phenomena of the metals lead, cadmium, bismuth and tin. The mechanism of the flow of metal during extrusion by the direct and inverted methods has been studied, and some attention has been given to certain of the extrusion-defects met with in technical practice, and the work of former authors in this field has been confirmed and extended. The chief part of the work is concerned with the determination, under precise control, of the relationship between the rate of extrusion, pressure, and temperature. This relationship is expressed in a series of curves, the mathematical treatment of which is indicated.

Dimensional Stability of Heat-Treated Aluminium Alloys, by J. D. Grogan, B.A., and D. Clayton.

Careful search has failed to reveal the occurrence of secular change in certain commercial heat-treated aluminium alloys, subsequent to the completion of the normal aging process. Serious dimensional changes occur when machining operations are carried out on material quenched in cold water. These changes are reduced to relatively small proportions in "Y" alloy and Duralumin, the only alloys examined in this way, by the employment of boiling water as quenching medium. Cold cottonseed oil produces intermediate effects. These alloys, when quenched in boiling water, develop satisfactory mechanical properties.

The Deformation of Metals Under Prolonged Loading. Part I.—The Flow and Fracture of Aluminium, by Professor D. Hanson and M. A. Wheeler.

Introduction.—It is known that metals subjected to static stresses for long periods of time will fail under tensile loads less than those necessary to break them quickly. The present paper describes experimental work carried out with a view to studying the mechanism of flow and fracture under prolonged loads.

Method of Investigation.—The principal method used has consisted in examining the changes in microstructure of polished specimens, subjected to static stresses at room and elevated temperatures. Aluminium was chosen principally because it exhibits the phenomena of "creep" at moderate temperatures, at which a polished surface capable of revealing the microstructural features of deformation can easily be preserved. A further advantage of this metal is that the mechanism of its deformation under many other types of stressing has already been studied. Specimens consisting of ordinary aggregates of crystals, of crystals of widely differing size, and of single crystals have been used. Measurements of the densities of the broken test-pieces have also been made. A few experiments have also been made with lead.

Conclusions: (1) The extension under a prolonged load that will ultimately break the metal may be conveniently considered as consisting of three periods: (a) A period of primary extension, during which the rate of flow diminishes; (b) a period during which flow is very slow or even suspended; (c) a period during which the extension again continuously increases until fracture occurs. (2) During the first period the flow of the metal is the result of slip within the crystals, and flow diminishes owing to the hardening effect of slip. (3) The behaviour during the second and third periods varies with different specimens. (4) Three types of failure have been recognized under creep conditions: (a) Failure by intercrystalline cracking; cracks form while the elongation is low, and the metal fails with little reduction of area at the fracture; (b) failure by the resumption of slipping within the original crystals, leading to a fracture of the normal tensile type; (c) failure through the recrystallization of the metal, removing strain-hardening and permitting further flow of the softened metal; the metal pulls out to a point fracture, with a high elongation. (5) Aluminium can fail by "creep" at room temperature. (6) Aluminium consisting of uniform aggregates of crystal fails at 250° C by intercrystalline cracking. (7) Aluminium aggregates at room temperature, and aluminium single crystal specimens at all temperatures, fail under creep conditions by shear along the slip planes. (8) In single crystals when flow recommences slip occurs only on some of the surfaces that had previously slipped during the primary flow. (9) The prolonged action of a suitable stress can cause disintegration of a metal either at the junctions of the grains or on surfaces of previous slip, and failure (i.e. fracture) must be regarded as having commenced when this weakening occurs. (10) Under suitable conditions, e.g. in crystal aggregates with moderate rates of flow at 250° C, or with very slow rates of flow in single crystals, slip is distributed over a very large number of slip surfaces, and a polished surface of the metal may show little or no signs of slip bands. (11) No change in density is believed to occur when a crystal is distorted by moderate amounts: changes in density in the case of crystal aggregates are thought to occur at grain boundaries. (12) The view is expressed that rupture of the crystals commences along slip planes formed at an early stage in the deformation of the metal. (13) The results are consistent with the theory of slip and rupture previously advanced by Gough, Hanson, and Wright.

The Effect of Artificial Aging Upon the Resistance of Super-Duralumin to Corrosion by Sea-Water, by Dr.-Ing. K. L. Meissner.

Corrosion tests were carried out in the North Sea between high and low watermarks with strips of super-Duralumin, 2 mm. thick (Duralumin containing 0.8 per cent silicon) for 3 months. The strips were previously annealed for 20 minutes at 500° C, quenched in cold water, aged at least 5 days at room temperature, and tempered for 20 to 40 hours from 50° to 200° C. A different "pock-form corrosion," combined with highly deleterious effect on the tensile properties, and primarily caused by intercrystalline corrosion, was found in an intermediate range of temperature at 125-145° C, and especially at 140° C. Strips which were artificially aged at lower or at higher temperatures, although also attacked by intercrystalline corrosion, showed no pocks, but still had a relatively smooth surface.

Investigation of the Effects of Impurities on Copper. Part VII.—The Effect of Antimony on Copper. Part VIII.—The Combined Effect of Antimony

and Arsenic on Copper, by S. L. Archbutt, F.I.C., and W. E. Prytherch.

The paper forms another section of the research in progress for the British Non-Ferrous Metals Research Association and describes a systematic investigation into the effects of antimony, and the combined effect of antimony and arsenic, on copper in the absence so far as could be obtained, of oxygen and other elements. In view of the great difficulty of removing the last traces of oxygen an upper limit of 0.02 per cent was regarded as satisfactory. In the antimony-copper series, alloys containing up to 0.85 per cent antimony have been studied, and in the arsenic-antimony-copper series, up to 0.5 per cent of each impurity together. In the former series, alloys containing up to 0.47 per cent antimony withstood hot rolling and up to 0.85 per cent, cold rolling from cast billets. An alloy containing 0.85 per cent antimony was hot short. In the latter series all compositions withstood rolling either hot or cold. The investigation deals with methods of preparation and casting; rolling behaviour; density; hardness; tensile properties at ordinary temperatures and at 250° C; fatigue and impact properties; electrical conductivity; softening temperature of cold-worked material; and microstructure. The solubility of antimony in solid copper has been re-determined. Antimony is highly soluble in solid copper and small additions of this element to copper low in oxygen are found to improve the tensile strength at ordinary temperatures and at 250° C, the fatigue properties, and to raise the softening temperature (of cold-worked material), without impairing ductility or toughness. Copper low in oxygen, containing antimony and arsenic together, appears to withstand hot rolling better than with antimony alone. The mechanical properties of copper low in oxygen are improved by small additions of antimony and arsenic together, to a greater extent than by additions of either of these elements separately. The softening temperature of cold-worked material is raised.

Both these impurities lower the electrical conductivity of copper, but antimony alone appears less injurious than arsenic alone.

Some Properties of Silicon-Aluminum-Bronzes, by L. J. Brice.

The paper describes the results of a detailed study of the Brinell hardness, mechanical properties, and microstructure of three typical aluminium-copper alloys, containing respectively 5.0, 7.25, and 10.0 per cent aluminium, with the addition to each of up to 5.0 per cent silicon. The alloys have been examined in the chill-cast condition, and also after subjection to mechanical and heat-treatments.

The Rolling of Alloys of Copper and Phosphorus Containing Up to 5 Per cent of Phosphorus, by Owen W. Ellis.

Rolling experiments are described on alloys of copper with 2-6 per cent phosphorus with and without the addition of 5, 10 or 15 per cent manganese or nickel. The plain phosphorus-copper alloys can all be successfully hot-rolled at 450-650° C to produce strip 0.021 inch thick provided that only small reductions of thickness are made at each stage of the rolling. In this way the copper-copper phosphide eutectic structure is thoroughly broken up and the strip can then be cold-rolled to 0.015 inch. Strip, 0.018 inch thick and 1.2 inch wide, made by hot-rolling the 5 per cent phosphorus alloy at 450° C has a tensile strength of 88.000 lb./in. 2 and is suitable for use as a high melting point solder for the electrical industry. Addition of manganese or nickel to the alloy renders it harder and much more brittle in the hot-rolling process.

Casting Brass

Q.—WE are sending you a sample brass casting. You will notice the surface is pitted with specks which we have been unable to eliminate although we have tried every means we know. Will you kindly examine this casting thoroughly and give us as full a report as possible, giving both the cause of the trouble and the remedy, if you are able to ascertain it.

A.—On examination of the sample brass casting we find the surface pitted as you state. We have cut through the casting and find this defect runs through the casting. When placed under the glass this condition shows all through the metal. This is one of the common diseases of non-ferrous alloys.

Briefly, the cause and means of detection of these defects are (1) sponginess due to the enclosure of gas, (2) the presence of oxide, or other drossy matter entering crystalline metal or eutectu alloy, (3) defects due to inequalities of composition caused by imperfect mixing of the ingredients, or (4) defects caused by improper melting, that is, letting the metal stay too long in the furnace after melting and reducing the fire and letting the metal soak.

We are of the opinion your trouble is either the metal containing oxide before you melt it, or in the melting. At any rate, your metal shows the presence of oxide and other drossy matter.

We suggest you first check up the class of material you are using. If ingot brass it may contain the oxide when you receive it from the smelter. If scrap brass is used we suggest charging all your metal in the furnace, not melting on top of the furnace. Much damage is done to metal by melting on the top of the furnace and then shoving the metal in the furnace as it becomes plastic or ready to melt. The metal takes up gas and it is given off in casting.

If new metal is used, melt the copper first, add the lead, then the zinc. Stir well and no trouble should occur if the melting is done properly.

We suggest the following as antidote for the metal you are using:

Just before pulling out the metal to pour, add a handful of salt to the metal Stir, and then add two ounces of 15% phosphor-copper to each 100 pounds. This may overcome your difficulty and will do no harm to metal properly melted and free from oxide.

W. J. REARDON.

Correction

Karl Pitschner, author of the article "Buffer Action in Nickel Plating," which appeared in the March issue, states that the term "Doctor" should not have been used in connection with his name. THE METAL INDUSTRY regrets the error.—Ed.

Chromium Plating Regulations

By OUR LONDON CORRESPONDENT

Discussion of Ventilation Regulations for Chromium Plating — British Chromium Platers' Views on the Health Hazards*

A SPECIAL meeting of the Electroplaters' and Depositors' Technical Society was held on July 23rd, 1930, where members exchanged views on the draft regulations for chromium plating. The President (Dr. Hutton) said that it was the duty of the Society to provide facilities for the fullest interchange of opinion on the regulations, but it would be understood that the Society had no official views on what was not, primarily, a technical matter; and any opinion expressed did not commit the Society in any way. He had great pleasure in introducing Dr. S. G. Overton, of the Home Office medical staff, who had been engaged on the examination of workers in the chromium-plating trade.

Dr. S. G. Overton, H. M. Medical Inspector of Factories, said she came to discuss the draft regulations in chromium plating, hoping to hear the views of the trade, but it would be understood that she spoke in an unofficial capacity, and anything she said must be interpreted in that light.

Whilst the control of chromium plating by regulation was new, somewhat similar dangers arose many years ago in industries in which bichromates were used; such as chemical works, tanning, dyeing, etc. Regulations made by the Home Office had markedly reduced the risk to the health of workers in these industries. A very careful investigation had been made of the necessary protection of workers in chromium plating plants, and the draft regulations resulted from this investigation.

Chromium was not regarded as generally poisonous to the system in the sense that lead, mercury and arsenic were. Chromium—in certain forms—was dangerous because of its irritant action on the mucous membrane and the skin.

Chromium plating had been declared a dangerous trade, and, therefore, the Secretary of State had power to make compulsory regulations for its control, under Section 79 of the Factory and Workshop Act 1901. Under Section 82 of this Act no person shall be precluded by any agreement from doing such acts as may be necessary in order to comply with the provisions of any regulation made under the Act. An employer was also required to furnish a printed copy of the regulations to any employee who requested it.

The following detailed notes on the draft regulations already published might be of interest. In the definition of an electrolytic chrome process, the inclusion of electrolytes containing salts of chromium was necessary because of the use of constituents in chromium plating baths of other substances than chromic acid. It was to be noted that the term "bath" referred not only to the tank or vessel in which the electrolysis was carried out, but also to those vessels in which any subsequent process was performed, e. g. swill tanks and neutralizing vats. Similarly, persons "employed" were defined as those employed in any process involving contact with liquid from a "bath" defined above; thus unwirers are included if they come within this category. Whilst the examining surgeon, in some cases, might be the firm's own doctor, a certificate must be obtained from H. M. Chief Inspector of Factories authorizing him to conduct the examination; further it was to be noted that suspension in cases of persons "employed" was to be recorded in the Health Register.

The power of exemption from the regulations vested in the Chief Inspector of Factories would allow such improvements in electrolytic chrome processes that succeeded in removing the health hazard.

It would be noticed that no details of the necessary draught were given; this being a matter better determined by inspection than specification. The exhaust must not be discharged in such a way that it could enter any other room in which persons were working. Every room in which were situated, not only plating vats, but swill and neutralizing tanks, must have a sound, smooth and impervious floor to facilitate frequent swilling. The use of aprons with bibs made of leather or rubber would be necessary for all persons "employed" and rubber boots and gloves in addition for those working at any bath. The maintenance and drying of such clothing was the duty of the occupier. The provision of the specified plaster and ointment for the treatment of injuries was necessary, as well as the provision of the usual First-Aid box; whilst the examination of the persons "employed" every 14 days was necessary owing to the speed with which the lesions became serious. The bi-weekly inspection by the foreman of the hands and forearms of the persons "employed" laid down in Clause 8 must be recorded in the Health Register. Chrome sores were often painless, and but for this inspection, might often pass undetected even by the sufferer himself.

Among the duties of the workman was his equal liability with the employer if he returned to work after suspension without the surgeon's certificate.

The following further general remarks might also be of interest.

The draught maintained across the vat was "efficient" if it would remove spray and fume from any part of the surface of the liquid. This could be determined by means of an anemometer, or, more simply, by noting the movement of a cloud of smoke directed on to the surface to

* For a previous article on this subject see THE METAL INDUSTRY for September, 1930, pages 431-2.

be tested. It was useless to provide a powerful exhaust system on the tanks unless there was sufficient means of access of air into the plating shop. For this purpose inlets at least three times the capacity of the fans should be maintained. The most satisfactory results were obtained when the level of the liquid was maintained not less than 8 in.-10 in. from the top of the duct to diminish the risk of spray. The usual diameter ducts would not effectively draw the spray over a greater horizontal distance than 18 inches, so that any tank wider than 18 inches should have ducts on each side.

The first swill, since it became a dilute solution of chromic acid, must be handled as carefully as the plating solution. Alkaline neutralizing solutions must also be regarded as dangerous, as alkali alone will cause dermatitis.

It was not wise for the plater to wire up the articles to be plated himself, as he was likely either to puncture his rubber gloves or to remove them, and then fail to replace them. Smoking by operatives should be discouraged, as they would almost certainly touch their faces with chromic acid contaminated gloves. Even when working under the best conditions, workers were advised to insert the ointment mentioned on the Cautionary Placard within their nostrils, and apply it to their hands and forearms, both before and after work.

In the subsequent discussion:—

Dr. R. S. Hutton pointed out the importance of the time factor, and emphasized the necessity of taking immediate steps to remove chromic acid from the skin, and to treat chrome ulcers.

E. A. Ollard said that he felt that the regulations were necessary, and, for the most part, reasonable, but that the wording was somewhat indefinite. Thus the local Factory Inspector would be the judge of whether the arrangements were suitable or otherwise. He trusted that the interpretation of the regulations would not be harsh, especially on the smaller platers, who were often not in a position to make expensive alterations to their plant, and would be uniform throughout the country. Among the more detailed comments which occurred to him were the following:—

The inclusion of the wording "Salts of Chromium" in the definition of a bath would bring under the regulations many solutions obviously not intended, as, for example, a copper sulphate solution containing 4 oz. per gal. of chrome alum. He suggested that these words should be changed to "Chrome Acid and Chromates," which would cover any solution likely to be harmful. He doubted whether polishers should be included under the regulations, as they did not normally come in contact with liquid from a bath. He would like to know if H. M. Inspector would consider an exhaust system efficient if it could be proved that it had been running some time without any trouble developing. The provision of a drained impervious floor was a great expense and difficulty to small platers, and in many cases impossible. Would grids or duckboards over the floor meet the case, particularly as such grids were already often used where the operatives had to stand at a higher level than the floor to work at the tanks?

He assumed that the leather aprons were for use of the polishers only, as leather was not suitable for contact with chromic acid. He wished to know what facilities would be required for drying the rubber clothing.

The medical examination at periods of fourteen days would inflict great expense and loss of time, especially on the smaller platers, and seemed unnecessary in the case of workers who had been employed for some time without injury. He agreed that new employees should be frequently examined, as some people were far more susceptible than others, but, in general, if the operatives were examined twice a week by a competent person, it would seem quite sufficient if they were examined by the doctor once a month. He was not clear whether the rubber gloves had to be worn continuously or only when required. The lack of ventilation and rubbing of the skin was very harmful, while the introduction of special jigs and frames with handles had made their use unnecessary, except occasionally. He also asked the view of H. M. Inspector of Factories on the employment of women and young persons in these processes.

S. E. Weill said that he felt convinced from his wide experience of over 100 chromium plating plants which had been under his observation during the last three years, that a fortnightly medical examination of workers on chromium plating plants was unnecessary. It was true that some persons, particularly those of fair complexion, were more susceptible than others to injury, but if newcomers were watched for a time until it was clear that they were not sensitive to the effects of chromium spray, then bi-weekly examination by the foreman, supplemented by an occasional medical examination was quite sufficient.

In the early days of chromium plating in England, when the exhaust plants were not as perfect as they are today, the speaker found some platers were not affected at all, notwithstanding that the chromium sprays were not all taken away by the exhaust plant. In fact he had in mind one plater who worked in a room where the speaker himself slightly felt the effects of the fumes, and in spite of this the plater who worked continuously in this room at no time showed traces of being affected by the chromium spray.

The speaker had used a test in which the appearance of yellow spots upon a sheet of tissue paper held above the bath was a sign of insufficient exhaust and had found this test satisfactory.

He was of the opinion that there are no dangers from the chromium fumes other than liquid spray.

A Member asked if any quantitative limits of concentration of chromic acid in the air and suitable velocities at the duct mouth had been laid down by the Home Office. If not, he felt that the employer was virtually at the mercy of the individual inspector. He was interested in the use of oil on the top of the solution, but was fearful of using a low flashpoint oil, whilst he had found oils of higher flash point, e. g. above 150° not so effective. He assumed that after the rinsing operations on plated articles, they could be handled without gloves. He considered that the polishers should be outside the regulations.

E. J. Dobbs asked if the washing facilities to be provided for polishers were only necessary if green polishing composition containing chromium sesquioxide were used. If so, were similar regulations contemplated for the polishing of stainless steel? He himself held that the green composition was not now necessary in the polishing of chromium plated work. Was the polisher compelled to wash, and if so, on whom did the responsibility of default fall?

The use of oil on the top of chromium plating solution was not satisfactory, as it caused reduction of the chromic acid and thus caused the solution to be spoiled. A further disadvantage was that if the article to be plated was dry when introduced into the plating solution, as was usual, a patchy deposit was obtained. This might later be overcome, but he thought it unlikely.

A Member asked if the regulation would apply to tanks used in the open.

J. W. PERRING was of the opinion that rubber gloves continuously worn might easily become a menace. In some cases it was difficult to avoid contamination of the inside of the gloves. He asked for information on the washing and testing of rubber gloves.

A MEMBER asked if the regulation would be satisfied by a plant enclosed in a room in which the operator did not enter except when plating was in progress. He asked for information as to whether neutralized chromic acid was dangerous and also whether the green sesquioxide or chromium sometimes used in polishing compounds was likely to cause skin affection. He was interested to know if perforation of the mucous membrane was a serious matter.

C. F. J. CARTER asked what treatment was advised when chromic acid had accidentally entered the eye and what treatment was advised for the cure of chrome ulcers.

A VISITOR asked for details of the aluminum chloride treatment of the skin for those who were compelled to wear rubber gloves for long periods.

DR. S. G. OVERTON in her reply to the discussion said that:—

Whilst chromic acid did not cause ulceration of the unbroken skin, small abrasions were often present or might at any time occur. These would rapidly develop into chrome sores if in contact with certain chromium compounds, hence the insistence on the wearing of protective clothing and the periodical medical examination. It was not necessarily intended that rubber gloves should be worn for the whole of the working period, but if the hands and arms were washed in one per cent aluminum chloride solution prior to putting on the gloves much of the discomfort from excessive perspiration could be avoided. The solution might be contained in buckets into which the workmen dipped their arms. Rubber gloves should be tested by filling with water. Gloves and aprons should be washed with water and hung up to dry; gloves might be turned inside out for this purpose. Before putting them on again it was of advantage to dust the inside of the gloves with talc powder.

It was true that precise standards of what was "efficient" or "suitable" were not defined in the draft regulations, for it was considered more satisfactory that the Factory Inspector should be judge of the adequacy of the precautions taken; they would not act unreasonably. The fact that no casualties had occurred could not be taken as evidence of the efficiency of the precautions. On the other hand, a paper had been published in America (U. S. Public Health Reports, Vol. 43, No. 26, September 7th, 1928, "Health Hazards in Chromium Plating," J. J. Bloomfield and W. Blum) which gave standards for air velocities at the ducts and of the purity of the air with which the Home Office were, in general, in agreement. Polishers would not, apart from washing accommodation, be included in the regulations unless they were actually coming into contact with liquid containing chromic acid and salts of chromium, but this, of course, might happen through insufficient swilling or from liquids entrapped in hollow articles. Dr. Overton would like to see washing accommodation provided for nickel polishers as well, though this was not laid down by regulation. Of course, it was not the responsibility of the employer to see that the polisher availed himself of the facilities.

Though salts of chromium were included in the definition of "electrolytic chrome processes" the exemption clause could be pleaded in respect to those special processes not involving risk to health. Similarly, exemption might be granted in other cases where it was satisfactorily proved that no danger existed. In the absence of exemption for some particular reason, the regulations would, however, apply to tanks used in the open. The provision of duckboards to prevent workers standing on a wet floor was being considered.

It had been found that fair persons were more susceptible, but there was no evidence as to the relative greater susceptibility of women and young persons. Information on this subject would be appreciated.

There appeared to be danger from fumes as well as from the spray produced by electrolysis.

It was to be noted that alkalis were irritant to the skin, but green oxide of chromium, as used in polishing "compo" was not irritant to the skin or mucous membranes.

Chrome ulcers could only be cured if made and kept clean; for this purpose the ointment and dressing advised on the placard were sufficient, but the washing of the conical sore right to the bottom with hydrogen peroxide was helpful. Solutions of ammonium polysulphide and sodium hyposulphite had also been recommended. If chromic acid got into the eyes nothing stronger than a mild alkaline wash of sodium bicarbonate should be used.

The following written communications were received after the meeting:—

G. L. HACK of Rudge Whitworth Ltd., stated that the Coventry and District Engineering Employers' Association were in general agreement with the precautions laid down, but felt the following amendments would be desirable:—

1. Floors should be rendered impervious, but not necessarily smooth.
2. Clogs and felt coverings for the legs would be preferable to rubber boots.
3. Aprons might be made of felt.
4. The occupier should only be called upon to provide reasonable arrangements for the storage and drying of protective clothing.
5. It was suggested that the medical inspection should take place at the factory rather than the surgeon's surgery.
6. Protection should be afforded to employers in cases where they unknowingly employed a suspended man.
7. The bi-weekly inspection by the foreman was considered superfluous.

F. L. JAMES considered that much of the trouble found was due to the ignorance of the workers in firms compelled by competition to undertake chromium plating without a real knowledge of its danger. He felt that modern plants made the dangers less severe and that a worker of one year or more experience should be exempted from the fortnightly examination. The continual wearing of rubber gloves was a menace in so far as any small amount of chromic acid inside the gloves was continually applied to the same area of skin. He had found it necessary to wear them only when putting the hands in the acid.

Soldering Aluminum

Q.—Will you please advise us how it is possible to solder aluminum with a soldering iron.

A.—There is some aluminum solder that they claim can be soldered with a soldering iron. However, there is so much difficulty in doing so we do not advise trying it.

The best method is to clean the article of dirt and grease, then heat the part to be soldered with a torch getting it hot enough to rub in the solder. As soon as the solder takes, it is very easy to build up whatever joint you desire as the solder builds up readily after the first adhesion to the article.

W. J. REARDON.

Metal Industry Prizes Awarded

Henri Marius, Leland E. Grant and Vernon E. Grant Awarded Prizes for the Best Articles Published in The Metal Industry During the Year 1930

IN our issue for January, 1930 we announced the first of a series of prizes for original articles, published in THE METAL INDUSTRY during each calendar year. These prizes of $50 each are awarded for the best articles in each of the two main branches of the metal industries which we cover, namely, metal manufacturing and metal coating.

The awards for the 1930 articles are in the hands of committees. For articles on metal manufacturing the committee consists of **G. H. Clamer,** chairman; **H. M. St. John** and **W. J. Reardon.** The committee considering metal coating articles is composed of **Oliver J. Sizelove, George B. Hogaboom, Dr. A. K. Graham,** and **Walter Fraine.** None of the above men needs any introduction to readers of THE METAL INDUSTRY as they are all nationally known authorities in their specialties and have appeared as authors in our pages for many years.

HENRI MARIUS

LELAND E. GRANT

VERNON E. GRANT

In all decisions of this kind it is impossible to get absolute unanimity. For that reason the judges were asked to present their first three choices in order. The articles named by each member were then weighed according to the degree of excellence assigned to them by each judge.

The winner of the prize for the best article on metal manufacturing (which of course, covers work in the foundry, rolling mill and manufacturing plant), has been awarded to **Henri Marius** of the Lenoir Car Works in Lenoir City, Tenn., for his article entitled, "Casting Railway Bronzes in Permanent Molds," published in our issue for May, 1930, pages 216-220.

The prize for the best article on metal coating (covering such fields as cleaning, plating, polishing, finishing, lacquering, etc.), has been awarded to **Leland E. Grant** and **Vernon E. Grant,** who are co-authors of the article entitled, "Variations in Thickness of Nickel Deposits," published in our issues for June, 1930, pages 275-276, and July, 1930, pages 325-327. Leland E. Grant is chief chemist of the Chicago, Milwaukee, St. Paul and Pacific Railroad. He is located in the Test Department of the Milwaukee shops. Vernon E. Grant is a plating foreman with the New Departure Manufacturing Company of Bristol, Conn.

THE METAL INDUSTRY offers its congratulations to the winning contestants, and thanks all those who contributed to its pages during the contest period.

Other Articles of Merit

It is only fair, in this connection, to point to the other articles and authors who were praised by the judges. The margin of these prizes was not wide. For that reason we list below and give honorable mention to those papers which the judges included among their first three choices.

The authors and articles on metal manufacturing, in order of the counts which they received, are the following:

R. R. Clarke, "Fundamentals of Brass Foundry Practice"; May, pages 221-222; August, pages 374-375; October, pages 466-467. Mr. Clarke is Superintendent of the General Electric Company brass foundries at Erie, Pa.

N. F. Budgen, "Oil Sand Cores for Non-Ferrous Castings"; August, 370-371; September, 417-419. Dr. Budgen is a metallurgist of Birmingham, England.

R. J. Anderson, "Smelting Secondary Aluminium and Aluminium Alloys"; November, pages 514-516; December, pages 555-556. Dr. Anderson is a consulting metallurgist in Cleveland.

F. A. Westbrook, "Pewter"; February, pages 64-66; "Quality Production of Pewter Hollow Ware"; March

116-117. Mr. Westbrook is a mechanical engineer of New Canaan, Conn.

C. K. Skinner, "Fundamentals of Successful Strip Brass Annealing"; September, pages 420-422. Mr. Skinner is with the General Electric Company in Bridgeport.

Those who achieved honorable mention for their articles on metal coating and finishing are:

Lawrence E. Stout and **Charles L. Faust,** "Salt Spray Corrosion Tests on Electrically Deposited Zinc-Cadmium Alloys"; August, pages 381-383. Dr. Stout is Associate Professor of Chemistry at Washington University, St. Louis, Mo. Mr. Faust assisted him in his investigation.

R. W. Mitchell, "Cleaning Aluminum"; April pages 171-172. Dr. Mitchell is Technical Director of the Magnus Chemical Company, Inc., Garwood; N. J.

M. M. Rose, "Plating Tank Rheostats"; October, pages 473-474. Mr. Rose is chief engineer of the Columbia Electric Manufacturing Company, Cleveland, Ohio.

L. K. Wright, "Comparative Measurement of Throwing Power in Electroplating Practice"; November, pages 522-523. Mr. Wright is an electro-chemical engineer residing in Jackson Heights, Long Island City, New York.

L. C. Pan, "The Cavity Scale for Measuring Throwing Power," June, pages 271-274. Dr. Pan is Instructor in Electroplating at the College of the City of New York.

THE METAL INDUSTRY tenders its thanks to these gentlemen who have forwarded the cause of metal manufacturing and metal finishing by their conscientious work and their willingness to give to the industry the results of their labors.

Difficulties in Chromium Plating

By A. KENNETH GRAHAM

An abstract from a paper, "The Practical Difficulties Associated with the Electrodeposition of Chromium," by J. W. Cuthbertson, presented before the Electroplaters' and Depositors' Technical Society, at London, October, 1930.

IN the interesting paper by the above author, a description of chromium plating of a great variety of commercial articles as it is done in England is minutely described. As one would expect, there is little difference in the practice abroad and in this country, and practical platers in America will recognize the importance of observing the conditions which the author summarizes as being necessary for obtaining satisfactory bright chromium deposits :

1. The solution giving the best results is made up of chromic acid and a sulphate, and should be carefully controlled. The current density and vat temperature should also be kept within fixed limits.

2. Careful preparation of work is important, paying special attention to the production of a good, bright nickel deposit under the chromium.

3. Lead is the only material that can be considered for anodes. The shape and arrangement of the anodes should be influenced largely by the type of work being plated.

4. No attempt should be made to plate large and small work at the same time in one vat. Small articles, such as screws, must all be wired separately, not put into a basket. A good method of handling small screws is to insert them into a piece of fairly heavy-gauge copper wire gauze.

5. Copper articles are best plated without a nickel undercoating. Nickel must be used, however, if the brilliant blue lustre associated with chromium is insisted upon.

6. Iron should not be allowed to increase in the vat above a very low concentration.

7. Success depends very largely on the individual. A properly developed technique plus careful attention by the plater to the details of the process will go far towards producing a sound finish.

Defective Chromium

Q.—I have a chromium solution that is not working properly. It is made up of 35 oz. chromic acid and ¾ oz. sulphuric acid. I use a lead lined tank and 1,500-ampere generator.

The work comes out a dead white. Plate does not get into the recesses.

A.—From the information given would be inclined to think that the sulphate content is too high. You should have added only 0.3 oz. of sulphuric acid, by weight.

Send us a sample of the solution for analysis, in a glass-stoppered bottle, and we will advise you correctly.

OLIVER J. SIZELOVE.

Auto Generator for Plating Current

Q.—We would like to inquire if it is possible to brass plate or copper plate tacks and small nails by using a generator from an automobile. Can we get sufficient current? Is there any reliable chemical solution that we can use for brass and copper plating and get fair results on this work in a tumbling barrel?

A.—You will not be very successful in using a generator from an automobile to furnish the necessary electromotive force to either copper or brass plate, as the amperage generated is very small. With the proper type of a plating generator you should have no trouble in plating in a barrel your class of work, either with copper or brass.

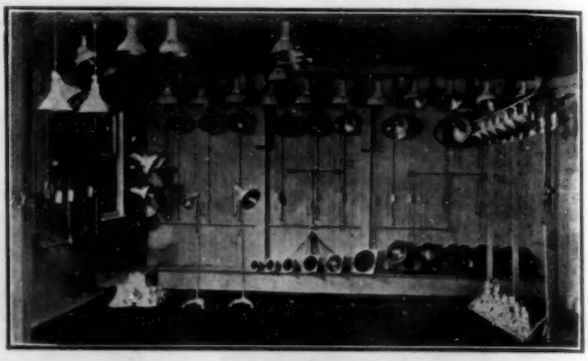
OLIVER J. SIZELOVE.

The Trend of Aluminum

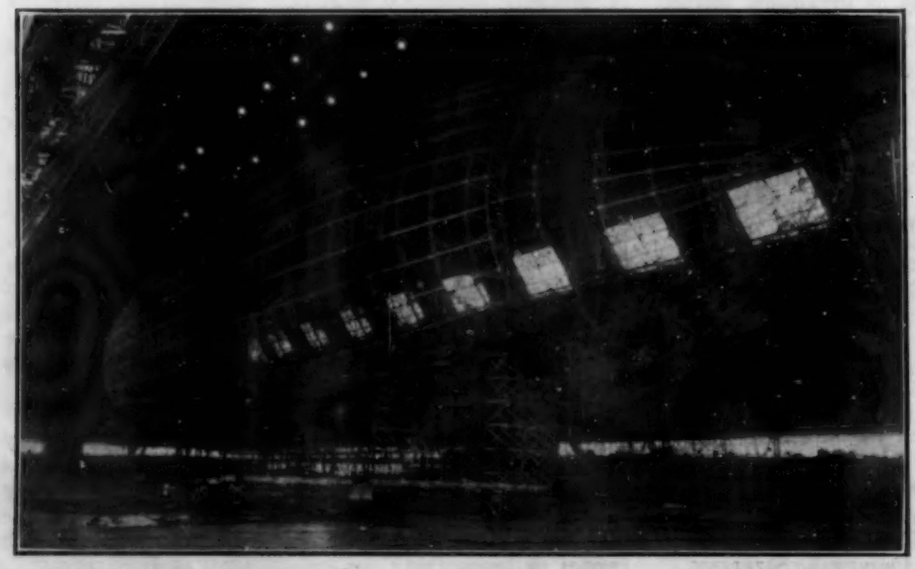
IT is always dangerous to estimate the future, even the near future, especially in times like these when scientific, technical and economic changes are taking place so rapidly. However, there are certain unmistakable signs which are too clear to be mistaken, and it is on such signs that we may, with some degree of safety predict the growth of developments which are taking place at this time.

Aluminum, which has enjoyed an unparalleled growth in the past twenty years, is still the metal with perhaps the greatest visible possibilities for the future. In 1929 the world consumed about 268,000 tons, according to the estimate of George Mortimer in THE METAL INDUSTRY of England for January 16, 1931. This represents an increase of 340 per cent since 1913. World consumption figures are not clearly sub-divided, but in the United States, which may be taken as representative, having consumed about 100,000 tons of aluminum in 1930, transportation took 38 per cent of the metal; electrical equipment, such as cables and bus bars, 16 per cent; cooking utensils, 16 per cent; machinery, including electrical appliances, 8 per cent; the iron and steel industry (in the form of metallurgical ingots) 8 per cent; building, 3 per cent; chemicals, 2 per cent; the food industry, 1 per cent, and general miscellaneous products, 8 per cent.

What are the large outlets for aluminum in the future? By all indications the use of aluminum will grow mainly by its extension in the building industry (in which it still plays only a small part) in spandrels, window frames, sills, skylights, finials, grilles, store fronts, etc.; by its increased use in electrical work, in which it has already assumed a place of importance; and by the growth of an industry in which it is prominent among metals at this time, namely transportation. (In aviation it is already predominant). But these are not the only openings. Aluminum is an important factor in aluminum bronze which has so far had a slow growth but is becoming more and more appreciated. Aluminum foil is becoming more popular. There are important signs of interest in aluminum for canning, perhaps as pure sheet aluminum and perhaps as aluminum coated steel. Aluminum furniture is growing rapidly. The Diesel engine which has a glittering future before it, has been greatly aided in its development by aluminum alloy pistons. There is talk also for aluminum bobbins for silk mills to replace wooden bobbins. One of the illustrations shows a very novel display of aluminum lighting units for store and show windows. Aluminum paint is expanding broadly. Aluminum has also been used to some extent in cast form for underground installations as the corrosion resistance of some of its alloys (for example the one that contains 5 per cent silicon balance aluminum) is great. Aluminum can be plated with other metals to match any desired finish. One of the newest developments in aluminum is the method of producing a variety of colors directly on an aluminum base. Trucks and busses are using aluminum structural shapes and strong alloy sheets in body frames. Railroad car construction uses aluminum beams up to 85 feet in length and 14 inches depth. Woven wire fence and barbed wire are being made in aluminum.



Display of Aluminum Lighting Units



Aluminum Alloy Structure for the Giant Dirigible "Akron," Now Nearing Completion

The illustration of the giant dirigible Akron, which is now nearing completion at the plant of the Goodyear-Zeppelin Corporation in Akron, Ohio, shows clearly that the fabricating possibilities of aluminum are practically unlimited. This ship will be 785 feet long and will have a nominal gas volume of 6,500,000 cubic feet. It will have a lifting power of over 400,000 pounds and will have a cruising radius of 50 miles per hour of over 10,000 miles. Its total horsepower of a little under 4,500 will enable it to achieve a maximum speed of something over 83 miles per hour. Airplane bodies and airplane wings are now being made in structural aluminum shapes which enables the building of larger and larger planes with formerly undreamed of load-carrying power and flying radius.

THE METAL INDUSTRY

With Which Are Incorporated
The Aluminum World, Copper and Brass, The Brass Founder and Finisher, The Electro-Platers' Review

Member of Audit Bureau of Circulations and The Associated Business Papers

Published Monthly—Copyright 1931 by The Metal Industry Publishing Company, Incorporated; Entered February 10, 1903, at New York, N. Y., as second class matter under Act of Congress, March 3, 1879

SUBSCRIPTION PRICE, $2.00 Per Year. SINGLE COPIES, 20 CENTS. Please remit by check or money order; Cash should be Registered. Advertising Rates on Application. Forms Close the First of the Month.

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Edition this Month, 6,000 Copies. Buyers Guide, Advertising Page 65.

Editorial

Business Improving

By all reports from business centers of various lines, and from those specializing in metals, there has been a fairly steady rise in business operations. This rise has not been rapid or of undue proportions. It is clearly not the false boom which occurred a year ago, nor is it looked upon as the forerunner of another year like 1929. It is a gradual recovery from the bottom of one of the deepest depressions we have ever had. Unemployment, which was at its height in December and January, is decreasing, and while the total number out of regular employment is still abnormally large, it continues to fall. So without any bombastic predictions for the future, immediate or far off, we can safely say that business is picking up.

We hope that it will not be long before business can turn a little from its preoccupation with immediate necessities to take some heed of the "long pull"; in other words, to prepare for the future by sound measures for the prevention of such declines as we have suffered. For this, proper planning will be indispensable. At the present time we have no central agency to do our planning for us or through whom we can work co-operatively. We must work individually. But we must also pull in the same direction.

That this realization is general is proved by the response to surveys which have been made by several large organizations in their quest for the solution to our problems. The McGraw-Hill Publishing Company has recommended a program based on its contacts with a wide variety of industries. Among these recommendations are the following.

1. The maintenance of our present high standards of living to facilitate the widest possible consumption of goods and services.
2. Stabilization of future business growth, checking the excessive and unbalanced industrial and financial expansion, preventing wide changes in price levels and incentive to speculative gain, and encouraging productive and commercial enterprise.
3. Promotion of international business co-operation to facilitate normal interchange of goods, services and capital, to enhance economic stability at home, and elevate standards of living abroad.
4. The encouragement of private initiative and responsibility, opposing government regulation, control or expenditure which tends to limit or weaken private initiative or to diminish the responsibility of individual business concerns for the accomplishment of the above objectives.

The responsibility for action leading to these objectives rests upon industrial and business management, industrial, trade and commercial organizations, banking and financial institutions, labor, and government, all working to the limit of their fields, but none encroaching upon the territory of others.

A survey of a large number of metal fabricators made by the Sherman Corporation showed the preponderance of opinion about the best methods of stabilizing business to be in favor of new product development, reduced operating costs, the lessening of competition through trade association practices, improved manufacturing procedure and the development of good sales and marketing plans. Other measures were recommended which received the majority of the votes.

In a general way there is unanimity of opinion concerning not only our difficulties but the measures for overcoming them. Whether these measures can be put into effect to a great extent by individual initiative or whether they should be furthered by a central planning body, such as has already been suggested in Congress, is open to much discussion. Unquestionable, however, is the fact that these plans in one way or another, must be put into effect.

Electricity in the Brass Industry

The brass manufacturing industry has been, for a number of years, familiar with the use of electrical energy for melting purposes. It is now almost a decade since the electric furnace swept the brass rolling mill before it, and a large part of the production foundry group. Electrical annealing, however, has been slower in making progress. According to J. C. Woodson of the Westinghouse Electric and Manufacturing Company, there are perhaps not more than 25 or 30 electric installations for brass annealing at present in the United States, and these are more or less special applications. Oil and gas furnaces are the most numerous, although wood fires are still used.

Although the annealing of brass is not a very difficult operation, care is necessary and progressive brass mills have been studying their heat treating practice. The objection to the use of electric current has always been largely its cost. There is little reason to doubt that if the cost of electric power could be reduced sufficiently, electric furnaces would supersede a large part of the present annealing equipment in existence. The annealing of copper and other non-ferrous alloys, such as nickel, nickel silver, etc., could also be done very adequately in electric furnaces if the costs would permit.

In the case of aluminum, the temperature control is very close, being given as plus or minus 5 degrees F. In many cases the temperature gradient from the heat source to the work must be as small as possible to prevent overheating of the extreme edges of the metal, thus making it necessary to have furnaces of special design. For this reason electric furnaces are considered to have some important advantages, and there are in operation some furnaces for annealing aluminum structural shapes up to 90 feet long. In the case of fabricated parts such as aluminum chairs, furniture, airplane parts, etc., special circulating fans are employed in the furnace chamber to make sure that all parts are in an atmosphere of constantly uniform temperature.

The handwriting on the wall seems to read to the effect that electricity is perhaps the best source of heat from a technical control standpoint. Its general use at this time is waiting for the solution of the problem of the cost of electric current.

Unveiling Metals

In no field of research has greater progress been made than in the investigation of metal structure. Metals and alloys are being probed as never before. Time was when we were content to see the surface alone with the naked eye. Then the microscope was focused on the polished and etched surface. After that came the spectroscope, and now we have the x-ray, which comes closer to laying bare the internal structure of materials than anything we have ever had.

This was set forth with unusual clarity by Dr. Arne Westgren, who delivered the annual lecture of the Institute of Metals Division in New York on February 19, 1931. Dr. Westgren showed how the x-ray diffraction pattern provided a simple and positive means of determining equilibrium diagrams which had resisted earlier methods. Even our old copper-zinc system yielded a new phase under the x-ray. One of the interesting aspects of crystal structure determination is the discovery of similarities between different systems.

Dr. Westgren's review of the various methods usually employed in the determination of equilibrium diagrams, and his comparisons with similar work using the x-ray machine, proved how great an improvement this machine has been and how much it has increased our knowledge of metals.

To be sure, at this time, most of this knowledge is still confined to the x-ray specialists who have been almost forced to create a new language to describe their work, and consequently have not been able to communicate their science in all its details to the great body of workers in metals. But time will remedy this condition. Evidence of the progress already made is the fact that all foresighted practical men engaged in industry admit the value and necessity of the work done by the theoretical metallurgist in developing ideas which can later be put into practice in the plant.

Standards for Plated Coatings

The first authentic step of importance to put the work of the electroplating industry on a fundamentally sound technical basis was taken in two conferences which were held in Chicago, January 16 and 17, 1931. The Research Committee of the American Electroplaters' Society and the Chicago Branch held these meetings, together with committees of the American Society for Testing Materials and a number of other parties interested in the industry.

One of these conferences studied the question of exposure tests of plated coatings, the purpose being to determine the relative value, for protection against corrosion of electroplated coatings, and to determine the relation of laboratory tests on such coatings to their protective value under varying conditions of service. Plans were made to start exposure tests in several different localities and at the same time to check these tests by accelerated corrosion tests, porosity tests, stripping tests, adhesion tests and tests for exposure to corrosion under stress. Standard solutions will be employed but no effort will be made to determine the best solutions possible for all conditions.

The second conference considered the question of electroplating standards, including both the materials used in plating and the plated products themselves. It was felt that specifications for the materials were desirable in many cases, to set the limits to impurities, with some exceptions perhaps, such as the regular acids and alkalies now in use. It was considered feasible, also, to specify the composition of nickel anodes, and this will undoubtedly meet with the approval of the whole plating industry.

Satisfactory specifications for plated products will be of great value to both the manufacturer and the consumer. The present competition with alloy steels and the wide divergence in prices quoted on electroplating work are only two of the obvious reasons for the existence of standards. Of course, all specifications should state also the correct method of testing, the specific requirements, and the means of meeting these requirements. Thickness of deposits, minimum porosity, resistance to corrosion and abrasion, minimum adhesion, and specified color and lustre are among the properties to be considered.

The special committee of the American Electroplaters' Society, cooperating with the Bureau of Standards and the American Society for Testing Materials, are making plans to carry on the research necessary. The work is of great magnitude and will take time; also, it will be costly. But no better expenditure and no more profitable investment could be made by the industry as a whole than the development of practical standards for electroplated coatings.

An Opportunity for Foundrymen

Foundrymen specializing in brass, bronze and aluminum castings have an opportunity before them. The American Foundrymen's Association will hold its 1931 convention in Chicago, May 4-7. (For a tentative program of the convention see the leading article in this issue.) It is this convention which presents the opportunity which foundrymen should grasp.

Every intelligent man engaged in the foundry knows that one of his most valuable assets is the one which is intangible—information. Without information about his metals, his sands and his equipment, he is helpless. The president of the company knows that without information about his costs he cannot safely set up selling prices. The metallurgist knows that without information about the constituents and structure of his alloys he cannot specify the best metal mixtures. Such information cannot be priced but it is invaluable. Strangely enough, it is not sold but given for the asking.

The program of the convention is concerned with the practical aspects of foundry operations such as molding, melting and pouring. It covers also cost-finding and apprentice training. It includes testing and metallographic investigation. It covers all phases of foundry work. Exhibits will be shown by manufacturers of equipment and supplies presenting to the visitors the last word in modern tools and accessories. We repeat therefore that the chance to attend this convention is an opportunity not to be overlooked.

Correspondence and Discussion

Nitrogen in Electrodeposition

To the Editor of THE METAL INDUSTRY:

The article appearing in the November issue (1930) of THE METAL INDUSTRY, on page 525, refers to a system of electroplating which requires nitrogen gas in the process.*

Merely as a matter of record I wish to call your attention to various patents pending and issued in connection with identical and similar processes, particularly Patent No. 1,777,121, issued September 30, 1930.

The process described in the claims of this patent has been successfully employed by the writer and a firm licensed under it for various metal depositions not possible of accomplishment by any other known process, for instance a step in the manufacture of photo-electric cells and the metalizing of the sound track on negative moving-picture films, etc.

Please do not interpret this letter as hostile. It is not meant to discourage anyone in experimenting along the lines suggested. On the contrary, the writer will be pleased to hear of any such developments, but as the patents are assigned to a corporation, commercial use should not be made without permission or license.

BALABAN AND KATZ CORPORATION,
Leslie L. Linick,

Chicago, Ill., November, 1930.

* "Recent Electroplating Literature," abstracts by Dr. A. K. Graham. The "article" referred to above was an abstract from "Studies in the Electrodeposition of Metals," by D. B. Keyes and Sherlock Swann, Jr. Correct reference is page 524 of the issue named.

[Note: The above letter was forwarded by the editor to Mr. Sherlock Swann, Jr., one of the authors of the paper involved. He replied as follows:]

To the Editor of THE METAL INDUSTRY:

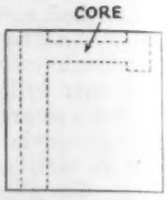
I judge that the patent to which Mr. Linick refers is concerned with the use of nitrogen gas in electrolytic processes. We only use nitrogen with the aluminum Grignards to drive out the air which oxidizes the Grignard. The nitrogen, as far as we know, is unnecessary in carrying out the electrodeposition. Any gas which is unreactive could be used to drive the air out. Also, this work is nothing but a laboratory experiment and has never been used for industrial purposes.

SHERLOCK SWANN, JR.

Removing Cores

To the Editor of THE METAL INDUSTRY:

Referring to Problem No. 4041, in your December, 1930, issue, about removing cores:



We make small brass castings and many are not pickled because they are minutely porous and then spot out after finishing. Rolling them in a ball burnishing barrel with small balls that are not smooth enough for ball rolling cleaned them excellently, but it was hard on the maple lining. Finally, we tried rolling them in a steel oblique rolling barrel with enough small balls to separate the parts from marking each other, and the parts cleaned up quickly and were free from any sand. The cored holes could not have been cleaned positively in any other way because of the location of the hole. The balls were ⅛ inch, and the cored hole ⅛ inch square and ¾ inch long, as per sketch.

PHILIP F. ATWOOD.

Terryville, Conn., February, 1931.

We have the letter of Philip F. Atwood in reference to Problem No. 4041, and appreciate the suggestion. However, the inquiry stated he had been rumbling his castings and that they were not satisfactory, and the problem was the removal of the core without marring the casting other than rumbling. Our answer gave a different method from rumbling which should be quite satisfactory.

We agree that using burnishing balls for cleaning small castings has been found quite satisfactory if the core is not too hard. In that case the core must be removed, also, before tumbling.

W. J. REARDON, Associate Editor.

Technical Papers

Engineering Foundation, Engineering Societies Library, and Administrative Department Reports for 1929-1930. United Engineering Trustees, Inc., 29 West 39th Street, New York.

The Application of Heat to Core Baking, by H. L. Campbell, University of Michigan. Issued by American Gas Association. Illustrated booklet; covers research on use of convected heat as compared with radiated heat in core baking.

American Standard Safety Code for Mechanical Refrigeration. American Standards Association, 29 West 39th Street, New York. The standards given were sponsored by the American Society of Refrigerating Engineers.

Journal of the Institute of Metals (British). A new publication; first number, January, 1931, 96 pages. Will have original articles, Institute news, and several hundred abstracts of metallurgical literature.

Symposium on Aircraft Materials. American Society for Testing Materials, 1315 Spruce Street, Philadelphia, Pa.; 189 pages, in cloth, $2. A unique, complete and authoritative collection of papers on aircraft materials by well-known specialists.

Fatigue of Metals. American Society for Testing Materials, 1315 Spruce Street, Philadelphia, Pa. Abstracts of Articles on Fatigue of Metals Under Repeated Stress Appearing in the Technical Press from July 1, 1929, to June 30, 1930. Prepared by the Committee on Fatigue of Metals.

Tonnage Melting by Coreless Induction, by E. F. Northrup, Ajax Electrothermic Corporation, Trenton, N. J. This article was published serially in "The Iron Age." This is a general summary of induction melting in coreless furnaces up to date. The sub headings in the article listed below give an adequate idea of the wide scope of the article.

History; Power Equipments and Type of Supply Recommended; Sizes of Furnaces; Chief Features of Construction of Furnaces of One Ton and Larger Capacity; Refractories for Large Furnaces; Reliability and Life of Furnaces and Electrical Equipment; Expansion of an Existing Equipment; Melting Efficiencies; Stirring of Metal and Power Density; Frequency Selected and Why; Typical Installations; The Coreless Induction Furnace as a Refining Furnace and Ladle; A Glance Into the Future of Industrial Melting; Bibliography

Shop Problems

This Department Will Answer Questions Relating to Shop Practice.

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Electroplating, Polishing, and Metal Finishing

O. J. SIZELOVE A. K. GRAHAM, Ph.D.
G. B. HOGABOOM WALTER FRAINE

Adding Manganese to Bronze

Q.—Would you kindly advise the best and cheapest method of introducing two per cent of manganese into an alloy of the following analysis: 58.60 copper, 1½-2% lead, 1-½% tin, ½% iron, balance zinc. We also use ¾ of 1% of aluminum in our ladles.

A.—We suggest that you use 30% manganese copper. This can be had from any of the large smelting companies. Using 6¾ pounds in your melt as given will give you approximately 2% manganese.

This material should be added as soon as the copper is melted. Get copper good and hot before adding manganese copper. Stir well, then add tin and lead, then zinc.

This would be a good way to introduce your iron:

Secure a manganese copper of 30% manganese, 7% iron, 63% copper, and add 6¾% of this alloy and it will give you the manganese you require, also the iron.

W. J. R., Problem 4,075.

Brass Plate on Iron

Q.—We are having difficulty getting a good yellow color on our brass plated work. We are sending you a sample of our brass plating solution for analysis.

This solution is 220 gallons. We use anodes of 65% copper and 35% zinc. Solution is operated at about 85 degrees Fahrenheit, with 3 volts. We allow 10 amperes to the square foot of cathode surface.

The work comes out coated over with a brown substance, especially around the outer edges. After brushing dry with a soft steel wire brush the plate has a reddish bronze tint. The brass plate is also streaky.

We are plating on cast iron lamp parts. We give them about 15 minutes in the nickel plating tank before brass plating.

We will appreciate any advice you can give us.

A.—Analysis of brass solution:

Metallic copper	3.85 oz.
Metallic zinc	.46 oz.
Free cyanide	2.14 oz.

Both the zinc and free cyanide contents are too low. We suggest that you add to the 220 gallon solution 7 pounds of zinc cyanide and 20 pounds of sodium cyanide.

For a brightener add a small amount of arsenic which has first been dissolved in caustic soda. A little ammonia will also help to produce a clean, even color.

O. J. S., Problem 4,076.

Brass Plating

Q.—We are sending herewith a brass plated link plated outside our factory. It is necessary for us to match this plating. We are sending along with this link some steel parts which are to be barrel plated and ball burnished to a high lustre. This must be an exact match with the link.

To date our plater has not been able to match this in barrel plating and we would greatly appreciate your telling us how to obtain the desired finish.

A.—The sample link has been finished in the following way, and if the same method is used on the parts you are making, no trouble should be encountered:

When the work is received after being assembled, it should be tumbled in dry sawdust to remove as much of the oil or grease as possible. Clean in alkaline cleaning solution, rinse in cold water, pickle in muriatic acid, rinse in clean cold water, and then steel ball burnish as bright as possible. The right burnishing medium should be used to prevent both the work and burnishing material from becoming tarnished.

After the work is burnished, it is brass plated and then steel ball burnished, dried and lacquered.

Your trouble in matching the color may be due to the condition of the brass solution. If you will send us a sample of the brass solution for analysis, with operating conditions of the solution such as type of barrel being used, revolutions per minute, current density, and temperature, we will then be in a position to advise you more fully.

O. J. S., Problem 4,077.

Cadmium Solutions

Q.—I am sending you two samples of cadmium solution, made up from formulae in the PLATERS GUIDE-BOOK. One sample is taken from a still tank and the other from the barrel plater.

When these solutions were new they operated very satisfactorily, but now they plate very slowly and produce a much darker plate than before.

I would appreciate your analyzing these solutions and advising what should be added to bring them up to first class condition.

I have noted that some formulae call for cadmium hydroxide. I presume this is for a brightener, but would appreciate your advice as to its use.

We have added sodium cyanide and some cadmium oxide, otherwise they are as the formulae.

A.—Analysis of still cadmium solution:

Metallic cadmium	4.91 oz.
Free cyanide	16.85 oz.

Free cyanide content is higher than what is used for a still solution.

Analysis of barrel solution:

Metallic cadmium	2.97 oz.
Free cyanide	15.97 oz.

We suggest that there be added at least two ounces of cadmium oxide to this solution. Cadmium hydroxide is not used as a brightener as far as we know.

O. J. S., Problem 4,078.

Dental Swedging Metal

Q.—I am sending under separate cover a dental model used for swedging gold plates. The formula is, copper, 1 part; antimony, 2 parts; tin, 8 parts.

It melts at 260 degrees centigrade. I wish to get a formula for a babbitt that is much harder, closer grained and with less con-

traction. I want it to pour smoother or more fluid than this one. You can melt this one or do anything you want. As a model it served its purpose.

A.—We would recommend a mixture of 68 tin, 28 antimony, 4 copper. This alloy will be close grained and harder, and will not contract any more than the alloy you are using. If you pour at a white color and do not overheat the metal it will not contract as much and will run well.

We suggest that you melt the copper first and just as it melts add 25% of the tin, then the antimony, then the balance of the tin. Pour out in small ingots and remelt for casting. Use Straits tin, Cookson antimony, and electrolytic copper. This should give you the results you desire.

W. J. R., Problem 4,079.

Finish for Brass

Q.—How was the finish produced on the sample candle cap we are sending you?

A.—The finish on sample cap has been produced as follows:

After the work is polished, it is cleaned the usual way for plated work, and then dipped into a solution of caustic soda 8 ozs., golden sulphuret of antimony 2 ozs., water 1 gallon. Use this solution boiling hot. Immerse for few seconds; rinse in hot water, then in cold water; dry in clean hardwood sawdust. Scratchbrush lightly on a fine crimped brass wire wheel. If the color is not dark enough, repeat the dipping and scratchbrush operations. Finally, coat with a good cellulose lacquer.

O. J. S., Problem 4,080.

Finishing Brass Castings

Q.—We are enclosing a section of 85-5-5-5 brass casting, the finish of which we are very much interested in. Can you tell us how this finish is obtained and the necessary steps for doing so? We use an ordinary $KMnO_4$ acid dip for coloring our red brass but cannot even approximate this particular finish.

A.—Your sample appears to have a little more zinc in the mixture than 5%. We would say approximately 8 to 10%. However, this would not make a great deal of difference in the color. This color is obtained by some of the leading producers of this line of work as follows:

The castings are water tumbled with a lot of fine slag so that they do not nick in the tumbling. When cleaned of all sand they are dipped in acid as follows: 38% yellow aqua fortis first; then in running water; then in commercial sulphuric acid 60%; then in running water; then in boiling water; then string them in the air to dry for a minute. This gives the color desired.

Another method is to make one acid dip composed of:

Yellow aqua fortis 38%—2 gallons.
Commercial sulphuric acid 60%—1 gal.
Water—½ gallon.
Common salt—1 ounce.

Let cool before using. This also gives results if there are no impurities in the metal, such as not more than .25% iron, or .05% antimony or aluminum.

W. J. R., Problem 4,081.

Gold Finish

Q.—We would be very much interested in obtaining a formula that will produce the gold and yellow color that is shown on the sample piece enclosed. There is only an extremely light plating of gold on this. Our feeling is that the shade is produced by some lacquer process, although of that we are not certain.

Our efforts with dead dipping and gold plating after that produces a much redder effect. We must have the yellow finish as indicated, and if you can help us out in that respect it will be greatly appreciated.

A.—The sample submitted has been finished in the following manner:

After the soldering operation, pickle in hot sulfuric acid to remove the borax from the hard soldering operation. Then bright dip and plate in cyanide copper solution for a few minutes, after which acid copper plate for 30 minutes. The work is then bright dipped, flashed in a brass solution, and gold plated in a salt water gold solution. The highlights are burnished and then the piece is lacquered with a good cellulose lacquer. There has been no color added to the lacquer.

The amount of gold that will be used to produce the finish should not be greater than 50 cents worth for a gross.

O. J. S., Problem 4,082.

Preventing Asphalt from Sticking

Q.—You might be able to help us in the following case, and I would be obliged for any suggestion. Our factory makes paper boxes from paper that contains a slight percentage of asphalt. When this paper is being cut, the asphaltous fibers stick to the cutting knives and plug up the grooves that correspond to the impression of the knives. To avoid the sticking of fibres, we tried to amalgamate the knives and the drum upon which the grooves are engraved, using coppersulphate solution and mercury, but had little success. The amalgam wears off quickly, and its application is very troublesome; the mercury rolls away. The knives and drum (upon which the grooves are) are made of steel.

Can you suggest some better method of amalgamation? Or, how could the drum and knives be electroplated with bronze? Bronze can be amalgamated better than steel.

A.—The amalgamation of any plated surface will not give you permanent relief from your trouble. We know of no way to prevent the asphalt from sticking unless it can be done by plating the steel with chromium. Chromium is a dense metal and when highly polished will not "wet" as ordinary metals will. It is quite probable that the asphalt will not adhere to it. It is at least worth trying.

G. B. H., Problem 4,083.

Silver Brightener

Q.—We would like to know why our silver solution will not take up disulphide of carbon as a brightener. We mixed this in but it does not seem to have any effect on the solution. Quite awhile ago we successfully used this material, but do not seem to be able to do so now.

A.—Carbon bisulphide used as a brightener in a silver solution should never be added directly to the solution. To dissolve the carbon bisulphide, use the following method:

Silver solution	1 qt.
Sodium cyanide	8 oz.
Carbon bisulphide	1 oz.
Ether	1 oz.

Place the carbon bisulphide and the ether in a quart bottle and shake thoroughly. Dissolve the cyanide in the silver solution and fill the bottle. Shake the bottle until the solution is saturated with carbon bisulphide and then filter. One ounce of this stock solution should be sufficient for each 15 gallons of the regular silver solution.

O. J. S., Problem 4,084.

Smoking Steel Molds

Q.—I have a question I would like to ask in regard to casting white metal in a steel die, using the smoking process on the die to make the metal run freely. I find great difficulty in casting letters, patterns 5/32" wide by ⅛" thick, with clean cut edges. I find that not only does the smoke not penetrate into the sharp corners of the die but that it wears off quickly. If there is a better process to treat the die before casting, I would appreciate your telling me about it. The metal we are using is tin 54%, zinc 45%, bismuth 1%. I don't use casting machines; I pour by hand.

A.—The smoke process is what is used mostly in mixtures for such work. If you use acetylene gas for smoking the mold, you will find it gives a more even distribution of the smoke and it gets in the corners more readily.

Any welding shop will smoke a mold for you and you can compare this method of smoking. The smoking of the mold is quickly done and if you do much of this work it will pay you to try it.

We do not know of any better method for hand pouring. If you use a machine there are quite a few washes for molds on the market; but as you say you pour by hand we recommend the acetylene gas smoke.

W. J. R., Problem 4,085.

Patents

A Review of Current Patents of Interest

Printed copies of patents can be obtained for 10 cents each from the Commissioner of Patents, Washington, D. C.

1,791,642. February 10, 1931. **Process of Plating Aluminum.** Louis Schulte, Pittsburgh, Pa.

The process of plating articles of aluminum, comprising passivifying the surface of the aluminum article, plating the passivified surface with an alloy of nickel and iron by the electrodeposition process in a bath containing nickel sulphate, iron sulphate, and a conducting salt and then electroplating the nickel iron coating with some finishing metal.

1,791,715. February 10, 1931. **Coating Metal.** Van M. Darsey, Detroit, Mich., assignor to Parker Rust-Proof Company, Detroit, Mich.

The method which consists in treating an article having a surface of iron or steel bearing a phosphate coating containing a metal having a potential different from that of the iron or steel, with a solution of a material containing the chromic acid radical.

1,792,082. February 10, 1931. **Metallic Coating and Process of Producing the Same.** Colin G. Fink and Li Chi Pan, New York, N. Y., assignors to Chemical Treatment Company, Inc., New York, N. Y.

An article having a protective and resistant coating thereon, said coating comprising a heat-treated plate of nickel on the foundation metal of the article, and a plate of chromium on said plate of nickel.

1,792,146. February 10, 1931. **Copper Alloy and Process of Treating Same.** Michael G. Corson, Jackson Heights, N. Y., assignor of three-twentieths to George H. Corey, Bayside, N. Y.

Process of treating alloys containing 4-18% tin and 10-35% zinc, with the balance principally copper, to improve their properties as lubricated wearing surfaces, comprising heating the alloy for such time and at such temperature as to bring about a uniform beta state of the alloy constituents, then quickly cooling to produce a hard acicular structure; then reheating to a point above the eutectoidal transformation point for the alloy to produce a structure characterized by the presence of beta crystals uniformly distributed throughout a matrix of alpha crystals, followed by slow cooling to produce stabilization.

1,792,210. February 10, 1931. **Method of Dezincing Lead.** Jesse Oatman Betterton, Omaha, Nebr., assignor to American Smelting and Refining Company, New York, N. Y., a Corporation of New Jersey.

Method of refining a bath of molten lead containing zinc, which comprises confining precooled chlorine gas in a reaction tank, and continuously recirculating the metal of the bath through said chlorine while maintaining the lower end of the tank sealed by the metal of the bath outside of said tank, to prevent escape of said chlorine.

1,792,262. February 10, 1931. **Method of Preparing Finely-Divided Metals or Metal-Metal Compounds and Resulting Product.** William C. Wilson, Hyde Park, Mass., assignor to William C. Wilson, Boston, Mass., trustee.

A method for the preparation of a metal in finely divided condition, which comprises reducing the metal from one of its salts by effecting intimate contact of the latter in a dispersed state with a precipitant metal, said precipitant metal being characterized by a chemical reactivity sufficient to liberate the metal to be reduced, and controlling the particle size of the liberated metal by the degree of comminution, less than 40 mu, of the precipitant metal.

1,792,542. February 17, 1931. **Method of Reenforcing Hollow Bodies Formed by Electrodeposition,** Arthur K. Laukel, Detroit, Mich.

In the process of forming a hollow metallic body on a depressed mold by electrodeposition, the operation consisting in building across the depression at a point where reenforcement is desired, a bridge having a conducting surface, whereby a metallic bridge is deposited integrally with the hollow body.

1,792,545. February 17, 1931. **Method of Casting Blooms of Aluminum.** Elmer P. McClure, Western Springs, Ill., assignor to Aluminum Products Company, a Corporation of Illinois.

The method of casting blooms of aluminum, the said method including guidedly conducting a narrow unagitated continuous stream of molten aluminum substantially parallel to the bottom of a mold to a point adjacent the upper end of a wall of the mold and then directing the stream downwardly along the wall of the mold so as to avoid splashing of the metal.

1,792,551. February 17, 1931. **Metal-Spraying Apparatus.** William S. Rice, Chicago, Ill., and Charles Marshal Saeger, Jr., Washington, D. C.

An apparatus for coating surfaces with hot molten substances comprising a heating chamber adapted to receive the substance to be reduced to a molten state, an atomizing nozzle disposed above the chamber, an induction tube communicating with the interior of the nozzle and extending into the chamber, an air supply under pressure and a tube connecting said air supply with the atomizing nozzle, said tube for the greater portion of its length encircling the heating chamber.

1,792,606. February 17, 1931. **Method and Apparatus for Determining Thickness of Metal Coatings.** Wesley A. Richards and Paul H. Kramer, Detroit, Mich.

The method of determining the thickness (weight) of certain metallic coatings, particularly tin and chromium, which consists in liberating the coating by a stripping acid, so that the salt of said coating will be in a reduced condition, with means incorporated in reaction reagent for measuring reduced salt.

1,792,944. February 17, 1931. **Copper-Silicon Alloy.** Eugen Vaders, Frankfort-on-the-Main, Germany.

A casting alloy consisting predominantly of copper and containing 1-4% of silicon, 1-5% of nickel, 4-6% of iron and an addition of 8-20% of zinc.

1,793,023. February 17, 1931. **Magnesium Alloy for Pistons.** Walther Schmidt, Bitterfeld, Germany, assignor to I. G. Farbenindustrie Aktiengesellschaft, Frankfort-on-the-Main, Germany, a Corporation of Germany.

A piston body made of a high percentage magnesium alloy containing 15% of copper, 2% of aluminum and 3% of silicon, the balance being magnesium.

1,793,069. February 17, 1931. **Method and Apparatus for Plating Metallic Surfaces.** Edward O. Dunkley, Richmond, Calif., assignor to Standard Oil Company of California, San Francisco, Calif.

An apparatus for continuously treating interior surfaces of metallic vessels comprising a continuous ringlike electrolyte chamber bearing an electrode and forming with the adjacent surface of said metallic vessel an electrolytic cell, means for moving said chamber in a plane parallel to said surface, means for supplying electrolyte to said cell, and means for maintaining a substantially constant volume of electrolyte in said cell.

1,793,110. February 17, 1931. **Die-Casting Machine.** Franz Ferdinand Mantei, Stuttgart, Germany, assignor to Friedrich Joseph Haas, Stuttgart, Germany.

A die-casting machine comprising a frame, a liquid reservoir on said frame, a guide on said frame, a die in said guide, means for reciprocating said die in said guide, a chamber adapted to receive a charge of fluid under pressure arranged intermediate said guide and said reservoir, said frame including a passage connecting said reservoir and said chamber, and means connected with said die for connecting said passage with the die across said chamber.

Equipment

New and Useful Devices, Metals, Machinery and Supplies

Single and Double Motored Buffers

A line of buffing machines with either single or double motor V-belt drives is offered by The Cincinnati Electrical Tool Company, Cincinnati, Ohio. The machines are stated by the manufacturer to be designed for the heaviest polishing jobs on production work. Any spindle speeds can be furnished and speeds are changed

Cincinnati Double-Motored Buffing and Polishing Machine

by changing motor pulley. Nickel steel spindles are mounted on four extra large ball bearings running in oil. Overhanging spindle construction is provided for handling work of all sizes. Motors are ball bearing, with safety type starters and push-button control.

Single-motored machines are available in sizes from 3 to 15 horsepower and double-motored machines from 3 to 10 horsepower.

Complete information is available to readers upon request to the manufacturer.

Aluminum Coloring

The use of aluminum has been extensively broadened by the recent development of the Alumilite process of treating and coloring aluminum. By a method of electro-chemical treatment it is now possible to finish aluminum articles in a variety of attractive colors and with a finished surface which it is stated, does not chip or peel, and is highly resistant to corrosion.

The widespread possibilities of this new use are demonstrated by products recently appearing on the market, such as flashlight cases, automobile parts, electrical appliances, hardware, camera parts, radio accessories, instruments, toilet articles and a multitude of other products.

Color coatings which consist of a dyed oxide film .0004 inches thick, are hard and quite resistant to abrasion, this resistance, it is claimed, being more than five times greater than five coats of baked enamel. The coating, tested by the Bierbaum method, has a hardness equal to that of an intermediate grade of steel. Applied to both polished and unpolished aluminum surfaces, this finish reflects the initial surface of the metal and in the case of polished surfaces, a smooth, lustrous result is obtained, whereas the unpolished or rougher initial surfaces result in dull finishes, which on some articles are particularly desirable.

Salt spray tests are said to show considerable resistance to corrosion and this factor makes Alumilite adaptable for use in marine motor parts, accessories and hardware. Heat shows little effect on the film itself, and practically all colors will stand up under 500° F.

The Aluminum Coloring Corporation, Indianapolis, Ind., is a licensee under the owners of the process, the Metals Protection Corporation of Indianapolis, and besides operating one of the largest production plants in the United States, have the right to grant other licenses.

For an extended description of this process, see THE METAL INDUSTRY for April, 1930, page 189.

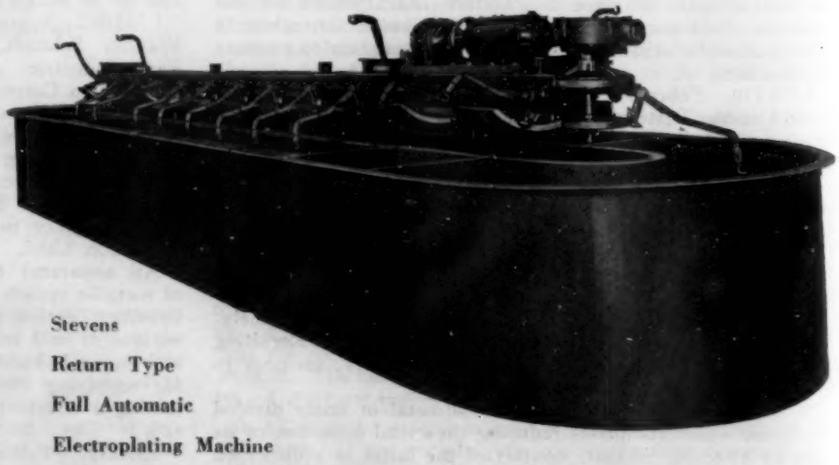
Automatic Chromium Plating

The application of automatic machinery to chromium plating is involved in the installation by the Westinghouse Electric and Manufacturing Company, at Mansfield, Ohio, of a return-type plating machine manufactured by Frederic B. Stevens, Inc., Detroit, Mich.

The machine is described by the manufacturer as a complete, self-contained unit. The tanks are grouped in oval arrangement, a conveyor mechanism running above them supported on a structural steel support member. The conveyor chain travels in a horizontal plane. Carried brackets are attached to conveyor chain and to these are hinged brass contact brackets with copper carrier arms for supporting the work to be plated. Carried arms may be spaced interchangeably to accommodate various sizes of racks. Transfer units run the length of the machine, attached to steel channels. The carrier arm travels around the machine with the chain. When it reaches a transfer unit it is raised and in turn raises the rack of work, moves to a position above the next tank, into which it lowers the rack. Smooth and rapid transfer action is said to be assured.

Contact is made between the contact bracket of the carrier arm and a bus bar at points where electric current is required for plating or other purposes.

For chromium plating the machine has been especially arranged to carry anodes along with the work, which when irregular in shape, must have special anode arrangements to insure deposition in recesses. Both anode and cathode contacts are provided on carrier arms for this reason.



Stevens Return Type Full Automatic Electroplating Machine

The manufacturer states that the machine is universal and that any kind of plating or cleaning operations can be handled in it by rearrangement of sequences. This is said to be a simple matter due to the cam arrangement, which can be easily rearranged.

A further advantage of the machine is said to be the absence of overhead construction of any kind. Tanks requiring ventilation for fume exhaust can readily be equipped for such purpose.

Cadmium Plating vs. Corrosion-Fatigue

By WILBER E. HARVEY

There is no steel, other than the stainless variety, which has a corrosion-fatigue limit of more than 25,000 lbs. per sq. in.[1] This statement includes carbon steels and all types of alloy steel with the exception of the stainless variety. By corrosion-fatigue limit is meant the highest stress which a metal will endure indefinitely when subjected to repeated stresses and exposed simultaneously to the corrosion action of some material. "Indefinitely" is often interpreted as meaning 10,000,000 cycles of stress under alternating flexure tests on ferrous materials.

The corrosion-fatigue limit of an alloy or metal is not a constant but only becomes a constant for one particular corroding medium.

There does not seem to be a correlation between any physical property and the corrosion-fatigue limit. The value or strength under simultaneous corrosion and fatigue seems only dependent upon electrochemical properties of the metal or alloy under test.

Visualize then the failings of even the strongest steels at the disposal of the metal users today. An alloy steel with a tensile strength of 250,000 lbs. per sq. in. and a fatigue limit (in air) of 108,000 lbs. per sq. in. would appear to be a very safe steel for use under both static and dynamic loading. However, if there is a corrosive action simultaneous with the dynamic loading, then the fatigue limit is lowered from 108,000 lbs. per sq. in. to about 15,000 lbs. per sq. in. The corrosion-fatigue value of this particular steel is about 6% of its actual tensile strength.

This example proves the inutility of even the strongest steels available for certain purposes and emphasizes the danger of corrosion-fatigue.

Metallic protective coatings seem to offer the best protection against corrosion accelerated by fatigue. The effects of thick zinc coatings were discussed by the author in another paper.[2] It would appear that cadium also should form a protective coating of value against the combined efforts of corrosion and fatigue, and with that thought in mind a series of tests were made, of which one set of results will be used as the basis of this article and the remainder published at a later date.

Dr. D. J. McAdam, Jr., has reported some tests upon cadmium coated chromium-vanadium steels which were tested at the Engineering Experiment Station.[3] Dr. McAdam found that the cadmium coating on the steel increased the life of the specimen very materially and concludes "that cadmium plating, when properly applied, is of considerable value in raising the corrosion-fatigue limit of spring steel in contact with fresh water." The cadmium plating for the tests was done at the Washington Navy Yard and two weights of coatings were tested, the results of which will be compared with the results obtained from the author's tests. The cadmium coating used by the author was plated by the Udylite process in the laboratories of the Udylite Process Company.

[1] D. J. McAdam, Jr., "Fatigue and Corrosion-Fatigue of Metals"; paper presented to International Congress for Testing Materials at Amsterdam, September, 1927.
[2] Wilber E. Harvey, "Zinc as a Protective Coating Against Corrosion-Fatigue of Steel." Metals and Alloys, Vol. 1, No. 10, April, 1930.
[3] D. J. McAdam, Jr., "Fatigue and Corrosion-Fatigue of Spring Material," the American Society for Mechanical Engineers, December, 1928.

It is not the intention of this article to compare the actual test values obtained by Dr. McAdam with those of the present tests. Dr. McAdam's tests were made with a cantilever type of specimen of his own design while the specimens of this test are of the R. R. Moore beam type. While the corroding agent in each test was fresh water, it is possible that the analyses of the waters were quite different which might have a slight effect upon the results. A comparison of the test results will, however, disclose the relative value of cadmium plating under two types of testing, if an actual difference exists in the types of testing. It seems very fair to compare the comparative protective values of the coating obtained with different methods of testing while it might be unfair to compare actual stresses obtained as limits with different types of testing.

	Engineering Experiment Station Cr-V Steel	Present Test .47 C Steel	Percentage Protection
Fatigue limit—(air)	69,000	61,000	....
Fatigue limit—(uncoated steel-water)	18,000	19,000	....
Fatigue limit—.0002" Cd. (water)	35,000	.....	33.3
Fatigue limit—.0004" Cd. (water)	42,000	.....	47.0
Fatigue limit—.00022" Udylite (water)	.....	45,000	62.0

The percentage protection offered by the cadmium coating upon the steel represents the approach toward a perfect resistance against corrosion. If the corrosion-fatigue limit were increased so as to coincide with the fatigue limit of the material in air, corrosion would then be eliminated and the protection be 100%.

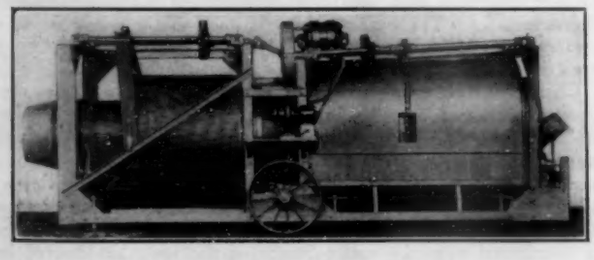
The corrosion-fatigue limit with such 100% protection would then be a direct function of the tensile strength of the metal and its corrosion-fatigue limit could be varied as the strength of the metal was affected by various treatments

In each of the cadmium plating tests there was a definite protection against corrosion offered to the underlying metal. The percentage protection offered to the base metal ranged from 33.3% to 62%. Doubling the weight of the cadmium layer increased the percentage protection somewhat as shown by the tests on chrome-vanadium steel and further increase in weight of coating might offer still better resistance against corrosion. The highest percentage protection was obtained with the .00022" Udylite on carbon steel. It is quite possible that the 62% might be considerably improved upon were a heavier coating of cadmium used. The low results obtained on the chrome-vanadium steel are probably due to defective adherence of the plating to the steel. Special precautions must be taken in pickling chromium bearing steels in order to prevent passivity.

Obviously from the above results it may be concluded that a well formed cadmium plating will offer considerable protection to the underlying metal against the combined effects of corrosion and fatigue. While it is not the perfect protection which might be desired for the metal, it is an extremely valuable asset in resisting the attack of corrosion accompanied by fatigue. By using a high strength steel coated with a good plating which offers 50% protection to the steel, it may be possible to have a corrosion-fatigue value of 50,000 or 60,000 lbs. per sq. in.

Automatic "Zinc Slinger"

A method for improving the appearance of galvanized work, assuring a more uniform protective coat and eliminating excess zinc from places where it would seriously hamper the function of the part, has been in operation in the Pittsburgh plant of Hubbard and Company for some time. High standards of quality prevail in the plant of this manufacturer of pole line hardware, and inspection is minute, it is stated. Scale is removed from parts previous to machining by the use of "Ideal" tumbling barrels. After being coated with zinc, the parts are taken from the zinc kettles and fed into a "zinc slinger" installed by N. Ransohoff, Inc., Cincinnati, Ohio.



Ransohoff Automatic Zinc Slinger

The first section of the "zinc slinger" is a slanting hooded perforated metal barrel, gas heated. The angle of this barrel is adjustable. It revolves at 50 r. p. m. As the work dances through, excess zinc is removed and is reclaimed in a chute beneath the hood. Parts travel into a larger drum, revolving slowly in water. This process quenches but does not cool, and the zinc is set. The finished parts are discharged and dry of their own heat.

The result is said to be a better finish, elimination of surplus

zinc on threaded work, increased production, and lowered costs. At the Hubbard plant hardware of different shapes, with and without threads, weighing up to 15 lbs. per piece is run through this machine.

Rhodium Plating Process

A rhodium plating solution and other supplies and equipment, together with license to use the proprietary solution, has been placed on the market by Sigmund Cohn, 44 Gold Street, New York City, platinum dealer. The Cohn process is stated to consist of flashing with rhodium the previously cleaned and polished work, which is usually jewelry or other precious metal objects. About ten seconds is required for the actual deposition of the rhodium.

The solution ingredients are sold in partly concentrated form, requiring only to be dissolved in distilled water. A platinum anode is required and this is the most expensive part of the outfit. The bath is strongly acid and capable of dissolving most base metals, even attacking certain white gold alloys. However, by proper manipulation it is said to be possible to produce very successful work on practically all gold alloys.

Complete data may be had by addressing the Cohn concern.

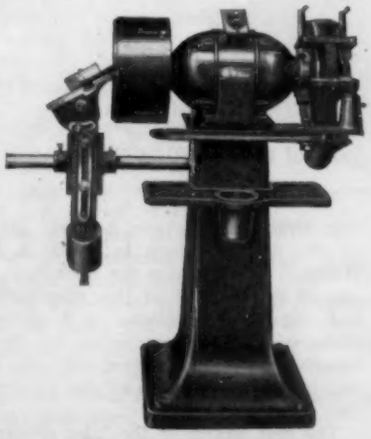
Electroplating Generators

Columbia Electric Manufacturing Company, Cleveland, Ohio, offers electroplating generators, with a guarantee that the brushes will last three years. This is said by the company to be a radical departure from the usual custom of both brush and generator manufacturers. Exhaustive tests have proven, however, that the brushes on Columbia generators will last that long and longer, under normal operating conditions, it is claimed.

The maker states that a good quality brush and the sparkless commutation of the Columbia electroplating generator at all loads makes the guarantee possible. The brushes are adjusted before the generator leaves the factory and locked in that position. It is not necessary for the user to make adjustments to eliminate sparking, and commutation is claimed to be perfect from no load up to extreme over-loads.

New Grinder for Tungsten Carbide Tools

In answer to demand for an economical method of sharpening tungsten carbide and other high speed tools, a new grinder, designed especially for this purpose, is now available through distributors by The United States Electrical Tool Company, Cincinnati, Ohio. It is known as the "U. S. Tungsten Carbide Tool Grinder."



Tungsten-Carbide Tool Grinder

The tool rest is pointed out as one of the interesting features of this machine. This comprises an adjustable table and a sliding guide which together hold the tool securely at any angle against the cup wheel. These are said to prevent the mechanic from grinding away more of the tool than is absolutely necessary to sharpen—an important item when considering the greater cost of this type of tool, and the longer life thus obtained. This also is said to prevent the tool from chattering and breaking away when in use. In addition, it is claimed that a perfect edge is automatically assured, and the tool thus gives better results.

Specifications state grinder can be furnished as illustrated or with cup wheel and swinging table on both ends. Full particulars and prices can be had from local distributors or by writing direct to Department 41, The United States Electrical Tool Company, 2490 West Sixth Street, Cincinnati, Ohio.

Comparators for Nickel Analysis

A new type of colorimetric apparatus for determination of metallic content and acidity of nickel plating solutions has been placed on the market by Hellige, Inc., New York. The apparatus is known as the "Hellige Comparator" and consists of permanent color discs of glass and a comparator mechanism on a stand in which the color comparisons are made.

Hellige Comparator

It is stated that the permanent color disc is superior to other methods since the standard colors are retained without change or necessity of checking for accuracy. The color discs are so arranged as to be operable by turning them around until the proper standard is selected. Results are read directly from figures appearing in the front of the apparatus, giving the degree of acidity (pH. value) or the metallic nickel content in ounces per gallon. Errors are said to be rendered impossible due to the arrangement of the comparator mechanism. Metal lamp is available for use with the comparator. Complete information may be had by application to the manufacturer.

Electric Immersion Heaters

The Harold E. Trent Company, 439 North Twelfth Street, Philadelphia, Pa., manufacturers of electrically heated industrial equipment, have added to their lines of apparatus electrical heating elements of the immersion type, constructed to be interchangeable with other elements made of a similar character. They are said to be built on new principles. The insulation in the unit itself is made up of refractories which are graded in the course of manufacture to permit of a maximum temperature with high dialectric characteristics. The heating element itself is the result of an investigation which determined the correct relationship between the area of the heating element and the outside casing.

Changes to either higher or lower wattage or voltage, or from one to three heat, does not involve the expense of a complete unit, or, in the event of a unit failing due to misapplication or other causes, the factory can readily install a new element within the casing, it is stated. While this unit is made for stock purposes with a seamless brass tube, bodies made of copper, steel, or chrome steel alloy tubes are available. For ordinary standard elements, the heat is distributed over the entire length of the unit, but desired heat concentration at different positions along the tube can be provided.

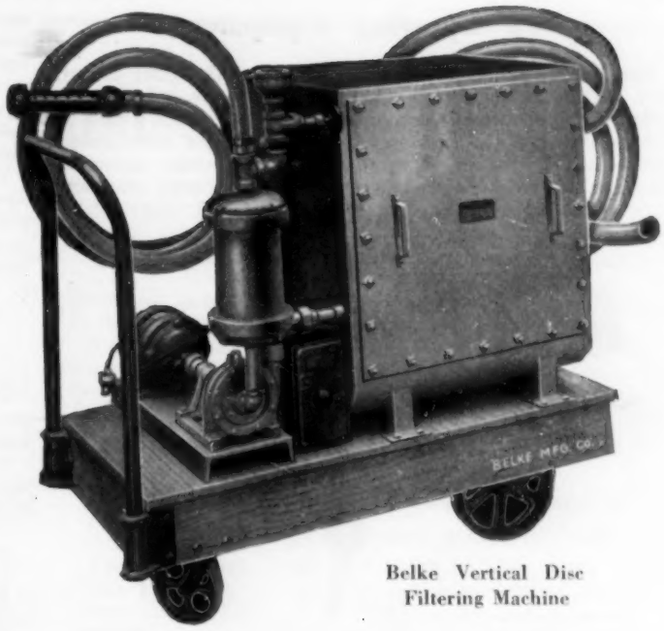
Vertical Disc Filter Machine

Filtration of electroplating solutions is considered good practice since it removes undissolved salts and makes for more rapid, smoother and uniform deposits. The use of machinery for filtering is generally recommended as being dependable and rapid.

A new vertical disc machine for filtering plating solutions has been developed by the Belke Manufacturing Company, 321 South California Avenue, Chicago, Ill. The machine, according to the maker, has an entirely new feature which considerably quickens filtering operations by making it a great deal easier to clean the machine.

Whereas discs usually are cleaned separately after disassembly, the new type of machine has a removable plate on the side of a 2½" filert tank and all cleaning is done by flushing with hose. Flushing can be done at a distance of four feet, it is stated, keeping operator clean and dry. Increased strength of tank and filter discs is stressed.

The Belke machine is made in eight capacities, from 300 to 2400 gallons per hour, each fitted with motor, starter and pump of suitable size. Complete data is contained in an illustrated leaflet obtainable from the manufacturer.



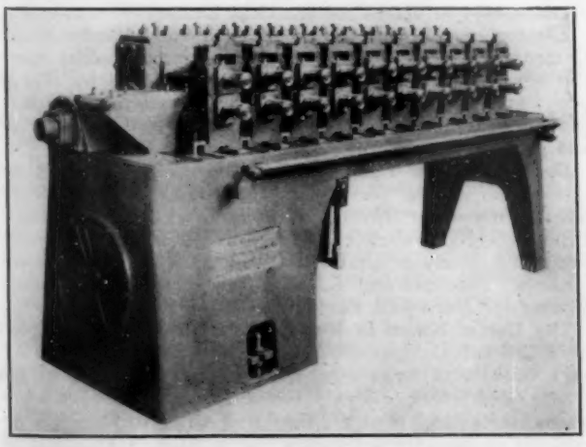
Belke Vertical Disc Filtering Machine

Roller Die Forming Machine

A roller die forming machine for sheet metal working is offered by the McKinney Tool and Manufacturing Company, Cleveland, Ohio. This machine, known as "Type F," is said by the manufacturer to combine precision and accuracy with ruggedness and stability necessary for heavy production without expensive maintenance costs. The machine has a heavy cast base and semi-steel cast housings grooved and doweled to bed. Built on the unit plan, each unit carries a pair of work spindles and as many units may be incorporated in the machine as desired. Each unit has individual speed reducer, permitting proper speed at each point of operation. Motor is mounted in base; multiple V-belt drive is used.

Some of the features stressed by the manufacturer are the sliding housings which are not bolted to the bed but slide from front to rear on guide strips doweled to bed, which permits housing to be placed against work roll regardless of width of section being rolled, and makes it possible to roll heavier sections. The machine may be used as a standard two-housing formed for heavy work, while by pushing housings back until ends of work spindles are exposed a strong outboard machine for light and medium work is made available. In some cases two jobs may be set up at once.

The machine is said to be useful for rolling many materials which cannot be formed by pressing, including high strength aluminum alloys of the heavier gauges, copper, brass, zinc, steel, stainless steel and other metals; metals covered with rubber, felt, etc., which must be rolled into angles or channels or any of a large variety of other shapes. The machine is built in two standard sizes; special sizes are available on specification.



McKinney Roller Die Forming Machine

Rhodium Plating Process

A process for the deposition of rhodium on jewelry is offered by Baker and Company, Inc., Newark, N. J., who state that they will supply the equipment and give a license to use their solutions and methods.

Rhodium plating has been found desirable for protecting jewelry and other expensive products from tarnishing and corrosion. Being one of the least corrosive members of the platinum group of elements, rhodium has the quality of remaining bright and lustrous longer than practically any other electroplate applicable, the Baker company states.

The finishes the Baker firm offers have been registered under two trade names: "Palroid" and "Everadiant." The process is said to have been developed through considerable research. It consists of plating the object first with palladium, another of the platinum metals, and then finishing with rhodium. The first finish of palladium is applied in order to make it possible to apply a minimum of rhodium, which is a rarer and more costly metal.

The licenses are issued at a flat rate, no royalty being required. Legal protection will be provided by the Baker company when patents, which have been applied for, have been granted, they state.

Speed Reducing Equipment

The Production Equipment Company, Cleveland, Ohio, announce that any of the motorized speed reducers manufactured by them can be supplied with shafts extended at both ends of unit.

For many applications this is particularly desirable. The motorized speed reducer consists of standard or special characteristic polyphase induction motors, mounted integrally with spur, helical, planetary or bevel gears retained in an oil tight housing. The low speed shaft from the speed reducer end provides a speed as low as 20 R.P.M., or may be supplied with a speed of as high as 376 R.P.M. The opposite shaft, direct from the motor provides high speeds of standard polyphase motors 1800, 1200, 900 or 720 R.P.M. For certain applications the unit can be supplied with speed reducers at both ends, thereby giving opposite shaft speeds alike or different from each other.

New Spraying Equipment

The Eureka Pneumatic Spray Company, 132 White Street, New York City, announce a new line of equipment, including the modernization of the old "Eureka No. 13" sprayer which is now to be known as No. 10. The chief improvements are more sturdy construction, lighter weight, more comfortable handle, renewable valve and certain other changes making for increased efficiency.

New "Eureka" Spray Head

A new model, No. 10L, has a removable top for changing over from one color to another without washing out the sprayer. Materials are kept in separate containers which have covers and fluid assembly attached. Change is made by a simple twist of the hand, it is stated. The removable top feature is the only difference from the No. 10 model.

The line also includes a new art brush of simple construction and operation, with spraying possibility of ⅛ up to 2 inches.

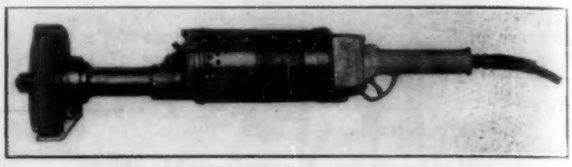
No. 50 is a new spray of large size, with dual valve and control of flat or round spray in the trigger pull. Removable fluid assembly in cartridge form for rapid changes from one color or material to another is a feature of this equipment. A three or five gallon pressure or overhead gravity feed is used. The dual valve feature is advantageous for finishing large surfaces requiring fan spray in combination with small or inaccessible surfaces requiring a round spray. No adjustments are necessary for immediate change from one type of spray to the other, pressure on trigger controlling both sprays.

The Eureka Pneumatic Spray Company was founded by W. J. Smart, now deceased, who received patents on spray equipment years ago, being a pioneer in spray finishing. The concern is still operated by the Smart family, the eldest son of the founder, A. W. Smart, managing it at present.

Portable Grinder and Buffer

The illustration here shows a new portable electric driven hand grinder and buffer which has been placed on the market by The Standard Electrical Tool Company, Cincinnati, Ohio.

This machine is equipped with a ½ horsepower General Electric high frequency motor for operating on 220 volt, 180 cycle, 3 phase current. The speed of the grinding spindle is 5400 r. p. m. The



New Portable Grinder and Buffer

size wheel used is 6″x1″x⅝″ bore, using the high speed bakelite wheels. The length over-all is 26″, and the diameter 4½″. The weight is 20½ pounds.

"SKF" ball bearings are run in oil and mounted in dust proof chambers. The switch is trigger type. The cable has four wires, one being used for a ground.

Equipment and Supply Catalogs

Metallic Packing. Metalastic, Inc., Union City, N. J. Leaflet on "Metalastis" ll-purpose packing.

Abrasives. Norton Company, Worcester, Mass. Booklet entitled "Beautifying Monuments with Alundum Abrasive."

Steam Flow Measurement. The Foxboro Company, Foxboro, Mass. 48-page handbook by L. K. Spink, giving complete technical data.

Brown Electric Co. Meters. The Brown Instrument Company, Philadelphia, Pa. Indicating and recording meters Catalog 3004, 32 pages, illustrated.

Polishing Lathe. Lewis Roe Manufacturing Company 1050 De Kalb Avenue, Brooklyn, N. Y. Leaflet on a new roller bearing lathe just placed on market.

Copper Welding. Murex Welding Processes, Ltd., Ferry Lane Works, Forest Road, London, E. 17, England. Booklet on the "Premag" process of welding.

Rod Machines. American Foundry Equipment Company, Mishawaka, Ind. Illustrated circular on equipment for straightening rods, bolts and other reclaimable material.

Second Lincoln Arc Welding Prize Competition. The Lincoln Electric Company, Cleveland, Ohio. Complete details of the competition, in a beautifully printed brochure.

C. E. Stoker Unit. Combustion Engineering Corporation, 200 Madison Avenue, New York City, Broadside on stoker units for heating and small industrial boilers. Illustrated.

Grinding and Finishing Materials. Walter C. Gold, 235 Race Street, Philadelphia, Pa. Catalog No. 3, for opticians; illustrated. Also circulars on plating supplies and equipment.

Comparators. Hellige, Inc., 179 East 87th Street, New York City. Catalog and circulars describing and illustrating apparatus for pH metallic content determination of nickel plating solutions.

Metropolitan Life Insurance Company, New York. Publications of the Policyholders' Service Bureau: Financial Statements in Annual Reports to Stockholders; Employee Magazines.

Uncommon Clay. Ferro Enamel Corporation, 2100 B. F. Keith Building, Cleveland, Ohio. The story of the discovery in Germany of a remarkable deposit of clay by the company's chemists and the subsequent efforts to make this material available to users.

Air Operated Controller Equipment. The Bristol Company, Waterbury, Conn. Catalog 4,000, in three sections: Instruments; Valves; Accessories. Each is fully illustrated and contains engineering data covering the products described. The sections are perforated for looseleaf binding.

Electrolytic Bright Dip. Hanson-Van Winkle-Munning Company, Matawan, N. J. A nicely printed booklet covering the new electrolytic pickling process developed by this company, and which was described in **The Metal Industry** for January, 1931, on page 35. The booklet goes into full detail and gives many applications of the process.

General Electric Company, Schenectady, N. Y. New publications: GES-686, Direct-Current Motors; GEA-1275, Fractional-Horsepower Direct-Current Motors; CR-9504 Thrusters; Type KG Squirrel-cage Induction Motors; G E Gluepots; Form IG Resistor Units; Helicoil Sheath-Wire Immersion Heaters; Types K and KF Vertical, Hollow-shaft Induction Motors for Deep-well Pumping.

The Use of Nickel in Non-Ferrous Castings. The International Nickel Company, 67 Wall Street, New York. A 16-page booklet of large size, covering use of nickel in brass, bronze and other alloys. Gives formulas, properties, and general metallurgical data. Very well arranged for quick reference. This booklet supersedes the company's excellent pamphlet, "Use of Nickel in the Brass Foundry."

Associations and Societies

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

American Electroplaters' Society

Milwaukee Branch

HEADQUARTERS, CARE OF J. N. HOCK, 1229 WEST 24TH STREET, MILWAUKEE, WIS.

Educational Session and Smoker

The Milwaukee Branch is holding a smoker and educational session on April 18, at their hall at North Third Street and Highland Avenue, Milwaukee, Wis. There will be no annual banquet this year.

The session will begin promptly at 8.00 P. M.

All platers and their friends who are interested, as well as chemists, manufacturers and others concerned with metal plating or finishing are urged to attend the session as well as the smoker which will follow. A good program of technical papers is promised, and there will be a big surprise for everybody at the smoker.

JOHN N. HOCK, Secretary-Treasurer.

The Electrochemical Society

HEADQUARTERS, COLUMBIA UNIVERSITY, NEW YORK CITY

Birmingham Meeting—April 23-25

The Spring Meeting of the Electrochemical Society will take place at the Hotel Tutwiler, Birmingham, Ala., April 23, 24 and 25. This is the fifty-ninth meeting of the Society. A splendid program has been arranged, including many papers, as well as plant visits, motor trips and social events. Of interest to members of the electroplating industry will be the program for Saturday, April 25, beginning at 9 A. M., when Prof. A. Kenneth Graham of the University of Pennsylvania, an associate editor of THE METAL INDUSTRY, will conduct a meeting on Electrometallurgy. There will be papers on nickel, chromium, silver, zinc, cadmium, calcium, lead, etc., discussed. Emphasis will be put upon deposition of gold and platinum metals.

British Electroplaters' Society

HEADQUARTERS, NORTHAMPTON POLYTECHNIC INSTITUTE, ST. JOHN STREET, LONDON, E. C. 1, ENGLAND

Review of 1930

The events of the past year, summarized below, indicate clearly that there has been no halt in the march of progress of the science and practice of electrodeposition in Great Britain. Despite depression (and sometimes, indeed, because of it) the industry has been keenly alive to every new development.

The position of chromium has become stabilized; the factors in the production of a sound deposit are now well known and in wide use. Its competitors, stainless iron and steel, have thus far had little success in checking the increasing use of chromium plate. The health hazard is engaging considerable attention just now, requisite government regulations for protecting the worker being in process of framing.

The value of cadmium is slowly but surely gaining recognition in this country, where its use is considerably behind that of the United States. Zinc plating is its chief rival, rather than chromium, but the merits of each are gradually becoming defined and the use of cadmium will doubtless expand steadily. The big reduction in the cost of cadmium metal in the last few months is an added stimulus to its use.

Important work has been carried out in deposition of cobalt-nickel alloys. In regard to the more common metals, the way to better and more durable deposits has been more surely indicated by the researches reported in recent months.

The Electroplaters' and Depositors' Technical Society has, of course, taken a leading part in all progressive measures, and will continue its efforts toward the advancement of the industry.

S. WERNICK, Honorary Secretary.

Exposition of Chemical Industries

HEADQUARTERS, GRAND CENTRAL PALACE, NEW YORK

During the week of May 4th to 9th inclusive, 1931, the Thirteenth Exposition of Chemical Industries will be held at the Grand Central Palace, New York. It has been announced that Student's Course in Fundamentals of Chemistry and Chemical Engineering will again be instituted under the chairmanship of Prof. W. T. Read, Dean of Chemistry at Rutgers University, who is a member of the Exposition Advisory Committee.

The exposition will include three floors of exhibits, which will include:

Chemicals: lacquers, enamels, industrial chemicals, alkalies, rust proofing, refractories, laboratory chemicals, solvents, metal coating.

Metals: castings, bronze, perforated metals, alloys (ferrous and non-ferrous), precious and semi-precious metals.

Machinery: pumps, crushers, grinding mills, pulverizers, drying machinery, vacuum rotary drums, pulverized coal equipment, industrial ovens, buckets, elevator, dust collection systems, conveying machinery, couplings, magnetic separators, blowers, spray nozzles.

Instruments of Precision and Laboratory Equipment: balances, scales, laboratory apparatus, testing instruments, laboratory sinks, hopper scales, stone flooring, laboratory furniture, acid proof sinks, acid proof stoneware, crucibles, pyrometers, tubes, towers, silica ware, automatic temperature control, gages, meters, recording instruments, regulators for pressure and temperature, tachometers, thermometers, glass pipe, electric ovens, chromium plating temperature controller, centrifugals, optical instruments, microscopes, colorimeters, hydrometers, respirators, porcelain ware, furnace accessories.

Rubber and Hard Rubber Products: acid resisting materials, barrels, drums, battery parts, chemical plant equipment, rubber lined tanks.

Association of Waste Material Dealers

HEADQUARTERS, TIMES BUILDING, NEW YORK CITY

The Association held its eighteenth annual convention last month at Chicago, Ill. On March 17 there was a meeting of the Metal Division. Reports of various departments and committees were heard, among them one on aluminum scrap specifications, which are now to be revised in the Association's Classification Circular L to conform to the gradings of the Aluminum Research Institute. Revisions were also made in certain other trade practices, including those concerned with automobile radiators; limit of leeway on tonnages delivered; No. 1 heavy copper; interpretation of terms "prompt" and "immediate" as used in the trade; and a proposal was entertained to standardize the list of scrap metal names in order to provide trade papers with uniform lists for quotation purposes.

Benjamin Friedman was re-elected chairman of the division.

The following papers were heard: "Importance of Copper and Brass Scrap in Industry," by Dr. J. W. Furness, chief Minerals Division, Department of Commerce, Washington, D. C.; "Collection and Classification of Scrap in Industrial Concerns," by Dan W. Gee, chief of reclamation work, Hawthorne, Ill., plant, Western Electric Company.

American Management Association

HEADQUARTERS, 20 VESEY STREET, NEW YORK CITY

Safford K. Colby, vice-president, Aluminum Company of America, spoke at the dinner and meeting of the Industrial Marketing Executives of New York at the Pennsylvania Hotel on Tuesday evening, March 17th, on "Product Development as an Approach to Markets." C. R. Cary, vice-president, Leeds and Northrup Company, Philadelphia, and vice-president of the American Management Association, presided. Mr. Colby is in charge of sales development and sales promotion for the Aluminum Company.

This was the first of a series of discussions on major problems of industrial marketing inaugurated by the Industrial Marketing Executives of New York, affiliated with the American Management Association. The Committee in charge includes Marshall L. Havey, general sales manager, New Jersey Zinc Company; E. C. Sprague, vice-president, Acheson Graphite Company; M. M. Watkins, assistant sales manager, Brown Instrument Company; Voyle L. Young, assistant sales manager, Walworth Company.

Personals

Robert S. Archer

Robert S. Archer, for the past ten years a member of the research department of the Aluminum Company of America, was recently appointed director of metallurgy of the A. O. Smith Corporation, Milwaukee, Wis., manufacturers of automobile frames, electric weld steel pipe and other products. He will direct about 100 men.

Mr. Archer has been interested in metallurgy for many years, starting at Cass Technical High School, Detroit, Mich., from which he graduated and went to the University of Michigan, where he received a degree in chemical engineering in 1916, and a year later a master's degree in science for a thesis "Annealing of Malleable Castings," which he wrote in collaboration with A. E. White, and which was published in the Transactions of the American Foundrymen's Association in 1918.

ROBERT S. ARCHER

Mr. Archer is widely known as an author of metallurgical treatises, chief of which is the book, "Science of Metals," in which he collaborated with Dr. Zay Jeffries. He has written about 25 papers and theses.

After graduation from college, Mr. Archer went to the Detroit Edison Company, Detroit, Mich., as research engineer. In 1918 he was research metallurgist in the bureau of aircraft production, and the next year he became research chemist of the Aluminum Castings Company. He was appointed research metallurgist of the Aluminum Company of America in 1920 and resigned from that position December 1, 1930.

He is a member of American Institute of Mining and Metallurgical Engineers, being a member of the executive committee of its Institute of Metals division; American Society for Steel Treating, being a member of its recommended practice committee and chairman of its non-ferrous data sheet committee; American Society for Testing Materials, Institute of Metals of Great Britain, Cleveland Engineering society and other technical organizations, as well as numerous clubs. Under Mr. Archer's direction was prepared the 120 page non-ferrous section of the National Metals Handbook of American Society for Steel Treating.

Tyler Pratt is again representing the Nassau Smelting & Refining Works, New York, in the New England sales territory.

Robert S. Hopkins has succeeded the late **Harry A. Hammond** as manager of the New York district sales office of the General Cable Corporation, 420 Lexington Avenue, New York City.

Leo London, formerly purchasing agent of the Fairmont Manufacturing Company, Fairmont, W. Va., has been added to the sales staff of the Girard Smelting and Refining Company, Philadelphia, Pa.

Louis J. Abrams, formerly with the Star Metal Company, New York, has been added to the ingot-selling and scrap-purchasing traveling staff of the Whipple & Choate Company, Bridgeport, Conn.

Joseph Millard sailed recently for London to superintend opening operations of two newly constructed brass foundries in England. Mr. Millard is president of the Extruded Metal Products Company, Bridgeport, Ohio.

William Olderman, formerly representing the Whipple and Choate Company, Bridgeport, Conn., is now on the sales staff of the Rochester Smelting & Refining Company, Inc., Rochester, N. Y., making eastern territory.

H. M. Schwartz, 940 East 24th Street, Brooklyn, N. Y., has joined the Bridgeport Deoxidized Bronze and Metal Company, Bridgeport, Conn., in the capacity of sales manager. Mr. Schwartz will make his headquarters in New York City.

H. E. Rose, for the past four years and latterly as secretary of The Weaver Brothers Company at Adrian, Mich., has now established himself in the same line of business, metal pickling equipment. Mr. Rose's new address is 11902 Phillips Avenue, Cleveland.

L. S. Sohn, formerly with the General Metals Refining Company, is now representing H. Kramer and Company, Chicago. Mr. Sohn is located at 722 Plymouth Building, Minneapolis, and will buy scrap and sell ingot in Minnesota, North Dakota, South Dakota, and western Wisconsin.

William G. Praed, formerly assistant to the general superintendent of the Link-Belt Company, Indianapolis, Ind., has been appointed radiograph engineer to take charge of the new commercial X-ray laboratory of the Claud S. Gordon Company, Chicago, Ill., industrial engineers.

Andrew W. Mellon, secretary of the treasury, and his brother, **Richard B. Mellon,** are to receive the medal of the American Institute of Chemists for distinguished service to the science and profession of chemistry. The announcement was made recently by the American Institute of Chemists and the public is informed of the award today, which is the seventy-sixth birthday of the Secretary of the Treasury. Richard B. Mellon was 73 years old in March. Both men have been identified with the development of the American aluminum industry. Richard B. Mellon is a director of the Aluminum Company of America. He was formerly president of the Pittsburgh Reduction Company, forerunner of the Aluminum Company of America.

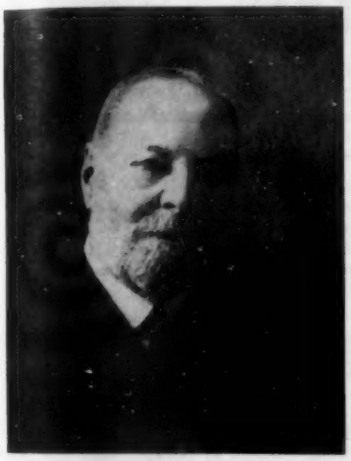
William A. Hamann has retired from his position as chairman and a director of the Roessler and Hasslacher Chemical Company, Inc., New York, manufacturers of chemicals for electroplating and other purposes. Mr. Hamann's career in the chemical industry lasted for almost half a century. He joined Roessler and Hasslacher in 1885, spending his early years with the company in its business department as clerk, shipper and in other capacities. He rose to the positions, successively, of secretary, treasurer, vice-president, president and, in 1928, chairman of the board of directors. He is credited with important contributions to the company's growth into one of the important chemical industries of the United States. For the future Mr. Hamann has made no very definite plans. He expects, however, to travel and to continue actively promoting Elka Park, a co-operative summer home enterprise in the Catskill Mountains, New York, of which he is treasurer.

Obituaries

Alfred Bishton Botfield

Alfred Bishton Botfield, founder and former president of Botfield Refractories Company, Philadelphia, Pa., and originator of high temperature cement and founder of that industry in the United States, died recently in Miami, Florida, at the age of 83. He was born September 20, 1847, at Shifnal, Shropshire, England, and received his education in the schools and universities of that country.

Mr. Botfield was originally a manufacturing jeweler in England, and recognized as one of the finest judges of precious stones on the Continent. He spent many years in extensive traveling, particularly in South America, Cuba and the United States.



ALFRED BISHTON BOTFIELD

While in Cuba in 1899, Mr. Botfield acquired a controlling interest in a marine construction and repair enterprise at Havana, which occupied his attention until the United States relinquishd direct supervision of Cuban affairs.

Mr. Botfield then came to this country, where he established the Botfield Furnace Specialties Company in Philadelphia, engaging in the building and repairing of stationary and marine boiler settings. He soon recognized the deficiencies of mortars then in vogue for laying up fire brick, which were employed only for the purpose of leveling up the courses to compensate for irregularities in brick dimensions. At the start of this century, he began his earliest experiments to develop a mortar which would function as a cement, to bond brick to brick in the same manner as one piece of iron was then being joined to another piece of iron by the process of welding which was a comparative innovation.

In 1907, Mr. Botfield produced the first commercial batch of his new bonding material, terming it Adamant, and it was used for the bonding of fire brick in boiler settings at the Continental Dye Works in Philadelphia.

Commercial acceptance of his new high temperature bonding material progressed slowly for a number of years due to the natural adherence to the use of traditional materials and skepticism of the value of such a radical development as a high temperature cement.

Visioning the market potentialities of high temperature cement in fire brick construction used throughout all industry, Mr. Botfield devoted practically his entire time to the further development and marketing of his pioneer product. Evidence of the accuracy of his vision and foresight is the fact that his original batch of a few hundred pounds of high temperature cement was the forerunner of the many thousands of tons of high temperature refractory cement that are produced annually in the United States at the present time.

In 1915, Mr. Botfield retired from active business, and the conduct of the Botfield Furnace Specialties Company was assumed by his son, Leonard Bishton Botfield, who is now president of the succeeding Philadelphia concern, Botfield Refractories Company.

Joseph H. Jolley

Joseph H. Jolley, member of the firm of J. H. Jolley and Company, Philadelphia, Pa., dealers in brass and copper, died in that city recently, in his sixty-ninth year.

James G. Patten

James G. Patten, president of the Metals Protection Corporation, Indianapolis, Ind., died recently. Mr. Patten has been identified with a number of large industrial concerns. At Kokomo, Ind., in 1909, he became manager and secretary of the Globe Stove and Range Company. Later he aided Elwood Haynes to establish the Haynes Stellite Company, of which Mr. Patten still later became secretary. Next he founded the Udylite Process Company, of which he was president until he sold the concern to the General Motors Corporation.

William H. Leiman

William H. Leiman, president of Leiman Brothers, Inc., New York City, manufacturers of jewelers' and metal workers' machinery, equipment and supplies, died on March 8, 1931, in his sixty-ninth year.

Mr. Leiman had been in good health up to within a few months of his death, and had taken an active part in the affairs of the large company which he had helped to organize years ago. Mr. Leiman was made president of the concern when it incorporated about a year ago, after carrying on its business for many years without a charter. He was associated with his brothers, George, John, Gustave and Edward Leiman, all of whom survive him. Another surviving brother is Henry Leiman, who is in business independently in Florida.

Mr. Leiman was an active man outside of business as well, being athletically inclined and a sportsman. He was a charter member of the Newark Athletic Club and a member of the Belmar Fishing Club.

Stanley H. Bullard

Stanley Hale Bullard, vice-president and works manager of the Bullard Machine Tool Company, Bridgeport, Conn., died March 23, 1931, at his home in Fairfield, Conn.

Mr. Bullard was born at Hoboken, N. J., fifty-three years ago, the son of E. Payson Bullard, founder of the machine tool concern bearing his name. He started as an apprentice in the plant and worked his way up through the sales department to general sales manager, which position he held for some years. He became vice-president and general works manager in 1906.

Philip O. Schleussner

Philip O. Schleussner, 53, first vice-president of the Roessler and Hasslacher Chemical Company, Inc., New York, and an active figure in the drug and chemical industry for over 25 years, died on March 21, 1931, at his home, "Wood Acres," Stamford, Conn. He had been ill with bronchial pneumonia since last November.

In 1906 Mr. Schleussner joined the company and took charge of the platinum division. In 1923, he was elected secretary and made director of the company, and in 1928, Mr. Schleussner became first vice-president.

Harwood Byrnes

Harwood Byrnes, vice-president of the Aluminum Company of America, Pittsburgh, Pa., died March 7, 1931, at his home in New York City, after a protracted illness. Mr. Byrnes was 45 years old and had been with the Aluminum Company for about twenty years. Mr. Byrnes was a Yale graduate in mining engineering, class of 1908. He joined the Aluminum Company as a salesman in 1909, serving in various large cities as district manager. He is survived by his widow, Mrs. Margaret McCracken Byrnes, and a brother, Ronald Muirhead Byrnes.

Stewart A. Trench

Stewart A. Trench, vice-president of C. S. Trench and Company, New York, metal brokers, died from heart failure on April 2, 1931, in his sixty-sixth year.

Mr. Trench was born in Jamaica, British West Indies, and was educated in England. He came here as a young man. In 1884 he joined his brother, C. S. Trench, in the metal brokerage business. He was widely known and very highly regarded.

Samuel J. Weil

Samuel J. Weil, founder and for about two years president of the United Smelting and Aluminum Company, New Haven, Conn., died March 8, 1931, after a year's illness. Mr. Weil came to New Haven from Charlottesville, Va., more than 50 years ago, and founded a corset concern. The metal company was started later. He gained considerable prominence as a philanthropist, besides being widely known for his industrial activities.

Philip Kempter

Philip Kempter, works manager for the Geuder, Paeschke and Frey Company, Milwaukee, Wis., manufacturers of hardware, died January 26, 1931. Mr. Kempter was 64 years old and had been with the company for thirty-three years. He was a very popular member of the management, both with his colleagues and with the employes.

News of the Industry

Industrial and Financial Events

Metal in Architecture

Vertical groups of Allegheny metal-fronted bay windows will enclose the sunporches of the new Kings County Hospital, now building in Brooklyn, N. Y. These sunporches are at the north and south ends of the central structure and also at the north and south end of each of the two wings. They extend seven stories in height in the central building, and six stories in the wings. The openings of each section are arranged in three vertical groups of English-type bays. The spandrels, vertical members and caps are of lead, and exterior grilles of Allegheny metal carry out the appearance of casement windows. The grilles are made of flat bars, ⅞" x 7-16". Roughly 25,000 feet of this bar, totalling 32,000 pounds, will be required for the six big groups of windows. The Hy Grade Iron Works, Brooklyn, are doing the fabricating.

Corporation Reports

Aluminum Company of America—Net income for 1930, $10,868,685, against $24,128,509 for 1929.

Aluminum Industries, Inc.—Year ended Dec. 31: Net profit after charges and Federal taxes, $185,732, compared with $209,435 in 1929.

Landers, Frary and Clark.—Year ended Dec. 31: Net profit, after taxes, depreciation and other charges, $1,064,661, compared with $2,337,105 in 1929.

Yale and Towne Manufacturing Company for year ended December 31, 1930, shows net loss of $296,931 after expenses and depreciation. This compares with net income of $2,585,624 in 1929.

Anaconda Copper Mining Company declared a quarterly dividend of 37½ cents per share placing the stock on an annual basis of $1.50 against $2.50, the rate declared in the previous quarter.

Gorham Manufacturing Company—Net income for fiscal year ended January 31, 1931, $112,731, against $1,182,235 for previous year. Past year's net was computed after charging reduction in value of inventory.

Bohn Aluminum and Brass Corporation and Subsidiaries.—Year ended Dec. 31: Net profit, after interest, depreciation, Federal taxes and other charges, $725,596, compared with $2,619,722 in 1929.

Revere Copper and Brass, Inc.—Year ended Dec. 31: Profit after depreciation, interest and other charges (including absorption of an inventory loss in excess of the $2,000,000 reserve previously created for the purpose), $7,701, compared with $3,279,679 in 1929.

Morrison Brass Corporation, Ltd., of Canada, in its first report to shareholders, covering the year ending December 31, 1930, shows operating profits, less reserves for depreciation, of $125,709. This, added to the balance carried forward of $390,747, made the total amount available for distribution $516,457. From this were deducted dividends on the preferred stock, $105,000, leaving a balance of $411,457. After deducting income tax for the 1929 period of $10,291, the total balance at profit and loss account stands at $401,165.

McAleer Manufacturing Company

What is believed to be a speed record in the presentation of a merchandising plan was achieved on March 9th by the McAleer Manufacturing Company, Detroit, makers of polishes and cleaners, when the company plane, "Miss McAleer," carried a sales plan from Detroit to Little Rock, Arkansas, in five and one-half hours. During the next few weeks the company will use the plane in the southwestern territory, visiting jobbers in Dallas, Waco and Houston, Texas; Oklahoma City; Fort Smith, Ark.; Wichita and Kansas City, spreading the news of McAleer's 1931 sales plans.

Brass Ingot Statistics

The combined deliveries of brass and bronze ingots and billets by the members of the Non-Ferrous Ingot Metal Institute, Chicago, Ill., for the month of February, 1931, amounted to a total of 5,067 tons.

On March 1st, unfilled orders for brass and bronze ingots and billets on books of members amounted to 24,652 net tons.

Incorporations

Biggs Aluminum Foundry, 1222 Greenland Avenue, Nashville, Tenn., was recently organized by **Jesse T. Biggs** and **E. R. Biggs,** to manufacture aluminum castings. J. T. Biggs is manager.

Royal Silver Manufacturing Company, Newark, N. J., has been re-organized with capital of $100,000 to take over and expand the company of the same name, with plant at 391 Mulberry Street, to manufacture steel and brass novelties. Incorporators include **Samuel Goldsmith** and **F. J. Klingel.**

The Copper Alloy Foundry Company, 150 Broadway, Elizabeth, N. J., has been organized to operate a foundry specializing in production of castings of corrosion- and heat-resisting alloys, including chrome iron, chrome nickel iron, Monel metal, etc. **H. A. Cooper** is president; he was formerly president of **William J. Sweet Foundry Company,** which recently suspended operations. The complete Sweet organization has been retained for the new company, and the latter will produce the full line of "Sweetaloy" castings.

Business Reports of The Metal Industry Correspondents

New England States

Waterbury, Connecticut

APRIL 1, 1931

The American Brass Company has received a large order from the Pennsylvania railroad for material to be used in the electrification of its lines. Although this will mean more business for the local plants, it is said there will be no change in the working hours for the present. Changes in employment in the future will depend upon the rapidity with which the specifications for the work are let out.

Rumors that there has been a far-reaching shake-up among the employes and even officials of the **Scovill Manufacturing Company** were met with a statement by **Chauncey P. Goss,** II, vice-president of the concern, to the effect that it is now doing only what other concerns did before and during the winter. Many employes have been laid off. The reason, he said, was that the company has been carrying them through the winter although its business did not justify it, because it did not wish to lay them off in the midst of the period of depression. Now that the depression is easing up a little, it was felt it would not be so serious to lay them off.

Scovill has bought from **T. B. Stephenson** of the **Stephenson Manufacturing Company** of Springfield the rights to his invention, "In-Ha-Lor," a combination receptacle and vaporizer for treatment of sore throat and colds. The local concern has been making parts for it since its manufacture was started recently.

Some reorganization is going on in the **Scovill Manufacturing Company,** which is expected to permit increased employment here. The business of the **Gilchrist Company** of Newark, owned by the local concern for some years, that of the **Arnold Electric Company** of Racine, Wis., and that of the **O. K. Fastener Company** of Syracuse is to be brought here and consolidated with the Oakville and American Pin Company plants, of the Scovill company. The only exception is that the small motor manufacturing of the Gilchrist company and the Arnold company will be moved to the **Hamilton-Beach Company** plant at Racine. Officials of the company deny that the operations of the Schrader plant at Brooklyn, N. Y., will be transferred here.

Officers of the **Lea Manufacturing Company,** makers of greaseless polishing compound, were elected last month as follows: president, **Robert S. Leather;** vice-president, **Earl W. Couch;** treasurer, **Robert S. Leather;** assistant treasurer, **Mildred S. Vensel;** secretary, **Earl W. Couch;** assistant secretay, **Mildred S. Vensel;** directors: R. S. Leather. Fred W. Lake, Michael F. Burns, Earl Couch and Miss Vensel.

Friends in this city of **David M. Ireland** of Detroit have sent comments to be put in the birthday book to be presented to him on his 80th birthday. He has been in the brass business for over 50 years. He was manager of **Matthew and Williard Manufacturing Company** about that long ago. He left here to go to Detroit, where he helped form the **Ireland and Matthew Company.** He was one of the founders of the **Michigan Copper and Brass Company,** now part of the **Revere Copper and Brass Company.**

A patent on a rheostat was secured last month by **Morris Bennett** of the **Scovill Manufacturing Company.**

Arthur G. Penrod, formerly an official of the **Bristol Company** of this city, was one of those lost in the explosion of the ship Viking off Newfoundland last month.

W. R. B.

Connecticut Notes

APRIL 1, 1931

HARTFORD—Arrow-Hart and Hegeman Electric Company directors declared a dividend of 50 cents a share on the 200,000 shares of common stock last month, payable April 1. The dividend for the previous quarter was 60 cents.

Standard Screw Corporation net earnings in 1930 were $534,957, or $8.16 a share on the common stock, compared with $22.76 a share the previous year. The number of shares outstanding is 59,500. Surplus at the end of the year was $3,841,773, an increase of $9,409. Dividends paid were $525,548. Equity value was $169.56 compared with $168.10 a year ago.

Underwood-Elliott-Fisher Company has developed a new model accounting machine which speeds up ledger posting and is simplified so that operators can learn the use of it quickly.

Bolt, Nut and Rivet Manufacturers Association, which has been ordered dissolved by the Federal Court, includes in its membership the **Hartford Machine Screw Company** of this city and the **Clark Brothers Bolt Company** of Milldale.

BRIDGEPORT—Bridgeport Brass Company has received a large order from the Pennsylvania Railroad, vice-president **William R. Webster** announces. It is rumored it is in the neighborhood of $1,000,000. It will take several months to fill, and while he would not say how many additional men would be put to work, he said some new men would be hired. Recently the company hired back 200 men.

American Chain Company's net income for 1930 was $1,685,115, equal after preferred dividends to $3.85 a share on the 250,221 common shares outstanding, a decline of 48 per cent from the high record of 1929.

Bullard Company for 1930 had a net loss of $241,630, compared with a net profit of $993,087, or $3.60 a share, in 1929.

NEW BRITAIN—All officers and directors of the **American Hardware Corporation** were reelected at the annual meeting last month. In a statement to the stockholders, president **George T. Kimball** stated that net sales in 1930 showed a shrinkage of about one-third, due to adverse conditions in the building industry. Reserves were drawn upon to the amount of $1,954,000 to meet dividend requirements. Mr. Kimball said that as it had not been the practice of the company in the past to take up as net profits, increases in commodity prices it was justifiable and proper to restore to surplus some of the reserves thus created.

Landers, Frary and Clark reelected directors and officers last month. Chairman of the board **Charles F. Smith** said that the company during the past year added to its investments in preferred stocks and municipal bonds, easily marketable and yielding better returns than U. S. bonds. Sales were off 20 per cent. The regular quarterly dividend of $1 a share was declared. Net profits for 1930 were given as $1,064,661 or $2.53 a share compared with $5.56 a share in 1929. Surplus was $5,873,601, a decrease of $615,339. Equity value was $40 a share, compared with $41.76 last year.

Stanley Works reported an equity value of $37.59 per share, compared with $40.26 a year ago. Dividends paid on preferred amounted to $210,000 and on common $1,300,000. Surplus was $7,048,018, compared with $8,485,771 a year ago. **President Clarence Bennett** said sales in all divisions were off 35 per cent from the 1929 volume. There was no general reduction of wages, but salaried employes were cut. Warehouse property in New York was acquired last year. The usual quarterly dividends of 50 cents a share on the common and $1.50 on the preferred were declared.

North and Judd Manufacturing Company declared its regular quarterly dividend of 50 cents a share last month, payable April 1.

TORRINGTON—Union Hardware Company has given orders to the rod, polishing, buffing and press departments to cut the working schedule from four days of 10 hours to four days of 9 hours. The company has been comparatively busy during the present depression and for a while some of the departments were working nights. In the standard and needle departments many of those laid off during the winter are being taken back and the working schedule has been increased.

The local freight office reports a considerable increase in tonnage the past month.

Torrington Company has declared its regular quarterly dividend of 75 cents a share, payable April 1.

MERIDEN—International Silver Company is concentrating production operations to bring about greater efficiency and economy in production. The Barbour Silver and Wilcox Silver divisions at Wallingford will be brought together here, it is said. The company's report at the annual meeting last month showed a net loss of $857,783, or $9.63 a share, last year, compared with a profit of $1,436,279, or $11.12, the previous year, after depreciation and federal taxes. Net sales were $14,492,118, compared with $19,600,590 the previous year.

ANSONIA—American Brass Company has plans prepared for a new wire factory to contain 50,000 square feet. This is part of a building program planned for several years hence. It may be some time before the work is started. In the meantime, work is being carried on to change the course of the Naugatuck River to conform to the requirements of the long term building program.

WINSTED—The Polymet Company expects to resume production shortly and expansion plans are under way. New wire drawing machines are to be installed. The company manufactures parts for radio units, and during February reported sales 150 per cent above those of the previous February.

Walter A. Jarvis, personnel manager of the **Chase Companies** of Waterbury, addressed the **Winsted Foremen's Club** at its meeting last month. He discussed good foremanship and the work of the Y. M. C. A. in giving courses of instruction to foremen.

NEW HAVEN—New Haven Clock Company reports a net loss of $350,911 in 1930, against a net profit of $327,957 in 1929.

Marlin-Rockwell Corporation has omitted the extra dividend on common usually paid at this time. It voted the regular quarterly dividend of 50 cents payable April 1. On January 1 it paid an extra of $2, and during the previous year paid three extra quarterly dividends of 25 cents each.

NORWALK—Segal Lock and Hardware Company reports a net income of $201,907 for 1930, compared with $246,913 for 1929.

TERRYVILLE—Notices have been posted in the **Eagle Lock Company** factory putting all the foremen and machine room employes on a 40-hour weekly schedule, or eight hours, five days a week. They previously had worked 55 hours a week. Most of the other employes have been on this reduced schedule for some time. W. R. B.

Providence, Rhode Island

APRIL 1, 1931

City Metal Company, Joe Gold, president and treasurer, has filed information at the City Clerk's office that it is the owner of **D. Gold and Son,** metal workers, 403 Eddy Street, Providence.

Colonial Pen and Pencil Company, Inc., of Providence has been incorporated under the laws of Rhode Island to manufacture pens and pencils with an authorized capital stock consisting of 600 shares of common stock of no par value. The incorporators are: **William A. Millard, John A. Bennett** and **J. S. Brooks.**

Empire Enameling Company has moved from 183 Eddy Street to 174 Chestnut Street, Providence.

B and O Chain Company has moved from 21 Eddy Street to 91 Sabin Street, Providence.

Manufacturing Jewelers' Board of Trade directorate at its organization meeting last month elected the following officers for the ensuing year: president, **Edgar M. Docherty** of the **William C. Greene Company;** first vice-president, **Lawrence E. Baer** of the **Baer and Wilde Company,** Attleboro; second vice-president, **Royal J. Gregg** of the **Ostby and Barton Company;** secretary-treasurer, **Horace M. Peck. Frederick A. Ballou, Jr.** of **B. A. Ballou Company, Inc.,** and **Edwin H. Cummings** of the **General Chain Company** were elected members of the executive committee for three years.

The Hadley Company, manufacturing jewelers, has been awarded the 1930 Jesse H. Metcalf Safety Prize in the contest conducted by the **Providence Safety Council** in co-operation with 76 industrial plants in Providence.

Oriental Craft Manufacturing Company, 535 Broad Street, Providence, is owned and conducted by **David Jagolinzer** and **Duncan B. MacKenzie,** according to their statement at the city clerk's office.

Williams & Chalken, Inc., has been incorporated under the laws of Rhode Island to conduct a manufacturing jewelry business in Providence with an authorized capital consisting of 100 shares of common stock of no par value. The incorporators are: **Alfred Williams, Percy W. Gardner** and A. L. **Sawyer.**

General Insulated Wire Company, Inc., Providence, has been incorporated under the laws of Rhode Island with a capital consisting of 1,000 shares of common stock with no par value. The incorporators are: **Salvatore Chiappinelli, Ernest Enider** and **Daniel H. Morrissey.**

Fletcher Jewelry Company, 212 Union Street, Providence, is owned and conducted by **The Orkin Jewelry Company, William S. Orkin,** president, of 191 Princeton Avenue.

Thirty members of the **New England Manufacturing Jewelers' and Silversmiths' Association** had an exhibit of their lines at the annual convention of the **Massachusetts and Rhode Island Retail Jewelers' Association,** held at the Hotel Statler, Boston, on Tuesday and Wednesday, March 24 and 25, which attracted general attention and won favorable commendation. The exhibition was the result of cooperative efforts of the two organizations to afford retailers an opportunity to see the complete lines of the various manufacturers. There was no attempt to make sales at the exhibition.

The Hadley Company, manufacturers of wrist attachments, has incorporated in its 1931 line of gold-filled attachments a new process of depositing precious metal on its product for protection against corrosion. The process is called Rhodamant. The company has also developed a patented alloy called "Hadleyite," an alloy for base materials, which is claimed to be proof against corrosion.

W. H. M.

Middle Atlantic States

Central New York

APRIL 1, 1931

For the first time since September, 1930, monthly employment statistics for Utica's four major industries reveal an increase in number of men employed and number of hours worked. The metal trades group showed an increase of 6.6 per cent in employment and 3.8 per cent in working hours.

Announcement was made March 26 that the **Seneca Brass Works,** 204 Seneca Street, Utica, is now under new management. **Thomas Tulloch** and **Charles Shecter** are the new proprietors. They were for many years associated with the **Utica Brass Works.** The firm does gold, silver and other plating, and specializes in the manufacture of brass articles.

Remington Arms Company, Ilion, is one of the 12 firms furnishing data on employment in the lead industries that has been utilized by Col. Arthur Woods, chairman of President Hoover's emergency committee for employment. The information furnished by the Ilion concern was turned over to **Clinton H. Crane,** president of the **Lead Industries Association,** who in turn presented it to Col. Woods.

Pierrepont B. Noyes, president of the **Oneida Community, Ltd.,** addressed employes of the concern March 1. Pessimism for the year 1931 was expressed by Mr. Noyes, who told the employes that the year would be better than 1930, but "not good." Asserting the whole world has been sick economically,

The executive expressed the belief that "the disease has passed its worst, but convalescence will be slow. . . . I am extremely optimistic over the future, but just when that future begins neither I nor anyone else knows."

Niles E. Robertson, general manager of the Oneida Community, said net loss from all operations in 1930 was $240,000, to which must be added state taxes and interest on gold notes. The future he said holds many positives. He asserted the closing down of the William A. Rogers plant at Niagara Falls, which employed 600 people, and transferring the work to this area greatly benefited Central New York.

An excellent business start for 1930 was reported by **Emil Steinhorst and Sons,** Utica, who are manufacturing equipment for the textile business. They make Monel metal dye tubs and dye utensils. The tubs and utensils are made with heavy Monel-cast frames. Metal kitchen, step, and bath stools put out by this company have resulted in substantial orders from Chicago, Milwaukee, St. Louis, Buffalo, and other centers.

Irving L. Jones, president of the **International Heater Company,** addressed the March meeting of the National Association of Cost Accountants in Utica.

Prayson Curry, Syracuse, was elected president of the New York State Electrotypers' Association at the annual meeting at Hotel Martin last month. Other officers: vice-president, **Randall Lakman,** Rochester; secretary-treasurer, **E. C. Gilbert,** Syracuse.

Organization of the **Identification Registry Service, Inc.,** was completed here last month, with **John F. Brand** elected president and treasurer. **Rice Tool and Die Corporation** was awarded the contract to make the plates which are to aid in locating stolen automobiles. The plates contain an indestructible number registered with the manufacturer of the car.

Trenton, New Jersey

APRIL 1, 1931

Some of the Trenton metal concerns report that business has shown a little improvement during the past month, while others announce that it has remained the same.

Edward J. Morris, formerly of Trenton, died in Philadelphia, Pa., recently from pneumonia. He was well known in chemical circles and was attached to the scientific department of **Hoffmann-LaRoche, Inc.,** Philadelphia.

The following concerns were chartered here: **Frank Herfort Art Metal Works;** 100 shares no par; Union City. **Falkenbach, Inc.;** manufacture lighting fixtures; $100,000; Paterson. **Chemical Research Company;** chemicals; 500 shares no par; Elizabeth. **Sep Laboratories, Inc.;** chemicals; 2,500 shares; Jersey City. **Silk City Metal Coatings Company;** coating cloth with metals; $100,000; Paterson. **Auto Reflecto Tail Light, Inc.;** manufacture auto lights; $100,000.

C. A. L.

Middle Western States

Detroit, Michigan

APRIL 1, 1931

Production in the non-ferrous metals has shown an uptrend during the past month. While this does not compare with the more prosperous periods of previous years, nevertheless it is encouraging when one considers conditions prevailing throughout most of the winter.

An increase of ten per cent a month in the production of automobile parts and accessories is reported. The plating industry has shared in the general increase.

David M. Ireland, president of the **Detroit Metal Specialty Company** and the **Wolverine Bolt Company,** recently celebrated his eightieth birthday anniversary. He was one of the organizers, and served for many years as president, of the **Michigan Copper and Brass Company.**

Frederic B. Stevens, Inc., manufacturer of foundry supplies, was well represented at the recent informal exhibition of the Purchasing Agents' Association of Detroit, held in the General Motors Building on March 31.

F. J. H.

Wisconsin Notes

APRIL 1, 1931

Wisconsin Art Bronze and Iron Company, has been organized in Milwaukee and is headed by **W. C. Schmeling,** who was formerly assistant general manager of the Wisconsin Ornamental Iron and Bronze Company, which some time ago consolidated with the General Bronze Corporation. For the last year and one-half, Mr. Schmeling was the manager of the Milwaukee plant of General Bronze and has been in the ornamental bronze trade for some 20 years. Other officers of the new concern are **Fred Van Kooy,** vice-president, and **A. R. Stark,** secretary-treasurer.

National Enameling and Stamping Company, Inc., operated in 1930 at a deficit of $268,671, compared to net income of $333,538 in 1929, according to the annual report released by **A. J. Kieckhefer,** president.

Articles of incorporation have been filed by the **C. I. Banker Wire and Iron Works,** engaged in the manufacture and sale of wire, wire cloth, perforated sheet brass, springs, etc. The company is capitalized at $35,000. Signers of the articles are **Peter J. Pinter, Anna M. Pinter** and **John H. Schlintz.**

A. P. N.

Other Countries

Birmingham, England

MARCH 20, 1931.

The tone of the metal markets has improved somewhat during the last week or so, with the result that prices have appreciated, strong copper sheets having been advanced £2 a ton to £77. Tubes are unchanged and the mills doing this class of work are not finding much improvement on the dull conditions which have prevailed the past six months. There were some good inquiries at the **Industries Fair** for rolled products in brass and copper, and manufacturers hope that orders will mature within the next few weeks.

The aluminum holloware trade is maintaining a fair standard of activity, despite the loss of important exports markets, which is to some extent made up by the increasing use of good class holloware in British households.

Brassfounders are still finding it difficult to secure business, and employment is below normal. The slackness in the building trade accounts for a poor demand for builders' brassfoundry, but it is hoped that seasonal demand will develop with the advent of better weather. There are still many housing schemes in prospect which will call for brassfoundry on a fair scale.

The report of the Council of the Institute of Metals presented at the 23rd Annual General meeting held in London on March 11 and 12 shows some very encouraging results despite a difficult year. The membership has increased from 2,122 to 2,160 and the financial position has been more than maintained. These results have been brought about because there has been no relaxation of effort and no waning of interest in the work of the Institute on the part of the members. New activities have been added to those already in being, and these in their turn have been fully maintained. The Council of the Institute reported that nothing could have

justified the existence of the Institute more completely than that it has been able in a time of such universal stress thus to extend and increase the efficiency of its services to the science and practice of non-ferrous metallurgy—which services are of such outstanding international importance.

An **Inter-University Metallurgical Conference** recently held in Birmingham was made the occasion of a presentation of the Thomas Turner Gold Medal to **W. R. Barclay,** managing director of **Henry Wiggin and Company, Ltd.,** a pioneer firm in the nickel industry. The prize was founded by the late John Smith of Edgbaston, Birmingham, to commemorate the contributions made to the science of metallurgy by Thomas Turner, who was professor of metallurgy at Birmingham University from 1902 to 1926 and now lives in retirement. The vice-chancellor and principal of the university, **Sir Charles Grant Robertson,** in making the presentation, emphasized that the medal was bestowed only upon distinguished metallurgists, and said Mr. Barclay was a very worthy successor to Professor Carpenter, Sir Gerard Muntz and Sir Robert Hadfield. He pointed out his distinguished scientific work in connection with non-ferrous metals, and above all nickel, saying Mr. Barclay was practically the creator of the nickel industry in the Midlands after the war. His service in connection with research, particularly for the government during the war, is also noteworthy. For some 20 years Mr. Barclay was on the staff of the University of Sheffield, where he did a great deal for the non-ferrous metal industry. Mr. Barclay, after acknowledging the honor paid him, delivered an address on "Some Recent Developments in the Nickel Industry." He referred to the developments in the last decade of pure nickel for industrial and commercial purposes—the pure metal in sheet wire and rod form for engineers—and said there had been a marvelous development in nickel-iron alloys, which had been shown to possess peculiar and extremely valuable magnetic properties. They had revolutionized telephonic and telegraphic communication. There were also very rapid developments of the corrosion and rust-resisting materials in which nickel was playing an important part. Stainless steel, for instance, contains nickel. Mr. Barclay next referred to the tremendous development of nickel chromium alloys for industrial and domestic heating. Finally, he discussed some of the newer alloys evolved in recent years. J. A. H.

Business Items—Verified

The second mill of the new alloy plant of the **Aluminum Company of America,** at Alcoa, Tenn., has been completed.

General Ceramics Company, will move its home office from 225 Broadway to 71 West 35th Street, New York City, May 1, 1931.

National Smelting and Refining Corporation, 215 West 40th Street, New York, precious metal refiner, has filed a bankruptcy petition.

Illinois Zinc Company, New York, announces removal of its eastern sales office, which is now located at 52 Vanderbilt Avenue, New York City.

The Philadelphia Metals Association held its annual meeting and election of officers at the Elks' Club, Philadelphia, Pa., Thursday evening, March 19.

Detroit Lubricator Company, Detroit, Mich., will show products for oil burner use at the eighth annual Oil Burner Show, at Philadelphia, Pa., April 13 to 18.

Anthony P. Savarese, 1 East Forty-third Street, New York, has been appointed receiver for the Greenwood Brass and Iron Foundry, 190 Twenty-fifth Street, Brooklyn, N. Y.

Chase Brass and Copper Company, New York, will have a complete line of copper tubing and fittings for use with oil burning equipment, at the eighth annual Oil Burner Show, at Philadephia, Pa., April 13 to 18.

Advance Foundry Company, Hamilton, Ohio, has been acquired by Long and Allstatter Company, Hamilton, which will operate this plant with the same organization. **R. A. Leeds** is manager.

Bellevue Industrial Furnace Company, Detroit, Mich., is now in the hands of a receiver who was appointed by the Wayne County Circuit Court in Chancery upon application of several persons to have the company dissolved. **Benjamin Unwin** is temporary receiver.

American Hard Rubber Company, 11 Mercer Street, New York, announces that at a meeting of its directors held March 12 it was decided that a new building would be erected at the Butler, N. J., plant, to house the hard rubber tank lining department. Work will be started at once.

McAleer Manufacturing Company, Detroit, Mich., has announced the first definite results of the McAleer profit-sharing campaign, which was started on the first of February. Checks totaling $13,982.20 have been mailed out to jobbers' salesmen as their share of extra profits for the month of February.

Keystone Manufacturing Company, 513 Hall Building, Kansas City, Mo., has been established to manufacture oil and gasoline registers for automobiles. Plans are in prospect for an aluminum foundry and **A. W. Johnson,** manager, states company will be figuring on equipment in two or three months.

Signal Aluminum Company, H and 28th Streets, Chattanooga, Tenn., has changed its name to Watson Aluminum Company and will add brass and bronze casting department. It already has an aluminum foundry, casting shop, grinding, polishing and lacquering departments. **J. H. Watson** is in charge.

Trenton Emblem Company, 120 Hamilton Avenue, Trenton, N. J., has been acquired by the **Edgely Brass Company,** Edgely, Pa. This firm operates the following departments: brass, bronze and aluminum foundry; brass machine shop, tool room, casting shop, plating, polishing, grinding room, lacquering.

Loewenthal Metals Corporation, Chicago, Ill., now exclusively occupy the offices and warehouse at 947 West Cullerton Street, Chicago. They manufacture the well-known "Lion Brand" ingots, and deal in all grades of scrap metals, specializing in auto radiators and battery lead. The personnel consists of **Joseph T. Yavitz,** president; **Sidney M. Yavitz,** secretary-treasurer, and **Louis Kahan,** vice-president.

Duriron Company, Dayton, Ohio, recently held an election of officers, with the following results: President, **William E. Hall;** vice-president, **Dudley H. Miller;** vice-president, **John R. Pitman;** secretary, **Robert C. Schenck;** treasurer, **E. B. Thacker.** Dudley H. Miller was appointed general manager. Mr. Hall succeeds P. D. Schenck, late president and founder.

Fairmont Aluminum Company, Fairmont, West Va., announces the appointment of the **Edgar T. Ward's Sons Company,** general offices at Pittsburgh, Pa., as eastern warehouse distributors of Fairmont aluminum sheets. The Ward company will stock Fairmont sheets in all commercial sizes, grades, tempers, etc., in their warehouses at Newark, N. J., Boston, Mass., Philadelphia, Pa., Buffalo, N. Y., and Cleveland, Ohio.

Ohio Brass Company, Mansfield, Ohio, manufacturer of electric railway equipment, has acquired similar branch of business of the **General Electric Company,** Schenectady, N. Y., including overhead materials and equipment for electric railways, electrified haulage equipment, etc. The purchasing company will consolidate with the main plant at Mansfield. The following departments are operated: Brass, bronze foundry; brass machine shop, tool room, zincing, plating, polishing, grinding room.

Wilcox, Crittenden and Company, Inc., Middletown, Conn., reports that removal of the machinery, stock, office equipment and personnel of the **National Marine Lamp Company** from Forestville, Conn., to Middletown has been completed. The Forestville plant is closed and its operations will be carried on completely at Middletown, where all correspondence should be directed. New catalogs are in preparation and until they are issued the latest catalogs of the two companies are to be used.

Review of the Wrought Metal Business

By J. J. WHITEHEAD

President of the Whitehead Metal Products Company of New York, Inc.

APRIL 1, 1931

The general revival of confidence is more in evidence and we now hear expressions to the fact that "we have seen the bottom." Certainly in the metal industry the prices of commodities seem to be scraping bottom. They are not making new lows daily, but rather are bumping up from their lows and then sliding down again. How long this will continue is anyone's guess, but in a broad way the action certainly would indicate that the worst is over. If this is so, and it certainly looks as if it were, there is only one thing that can happen and that is that the situation will improve after it has passed through this hesitant stage. It is therefore only logical to believe that from this level of prices firmness will develop, and then, as conditions and particularly demand further improve, the trend will be up.

The copper, brass and bronze product business is not normal, by any means, but it is also not as badly off as many other lines of industry. During the month of March the demand for copper and copper products increased apppreciably and was well ahead of January and February demand. This increase is particularly noticeable in the number of orders received, rather than in a tremendous increase in the tonnage on any one or a few orders. In other words, the pick-up has been general and diversified.

It is expected that the increased demand for copper and copper products, gauged by the number of orders, will be maintained for several months at least, and that gradually the quantities needed will be increased.

The fact that more aluminum was needed in 1930 than in 1929 plainly shows that this metal and its products is in continual and increasing demand. Aluminum is relatively a newcomer among the metals, and because of exploitation efforts the newer uses take up the slack at times of recession. At the present writing the demand for aluminum continues at a satisfactory rate.

With the pick-up this spring the demand for nickel and Monel metal and the various products produced from these metals has shown an appreciable increase. As with copper, the number of orders has increased in number and in some instances the tonnages asked for are such that the purchaser is more than taking care of his hand-to-mouth requirements. There is every indication that the demand for nickel and Monel will more than keep pace with the general recovery.

The fact that railroad income is off indicates that small tonnages are being shipped by truck, quick delivery being wanted. As soon as demand becomes a little greater tonnage lots will again start to move. The demand for metals of all kinds is greater than ever before, and the continued demand for metal of all kinds in ever increasing tonnages is assured.

"The sap is running" and slowly but surely improvement is indicated and, in fact, is already under way.

Metal Market Review

By R. J. HOUSTON

D. Houston and Company, Metal Brokers, New York

COPPER

APRIL 1, 1931

Market movements were erratic lately, with price losses of half a cent per pound despite indications that the industry as a whole was in sounder position. During the three months ended February 28 deliveries of copper have definitely exceeded refinery output for the first time in more than a year. Production has been drastically curtailed, and showed a decrease of 51,258 tons in the first two months of this year compared with the same period last year and a reduction of 93,546 tons in comparison with the corresponding months in 1929. The favorable fact is that demand is now absorbing every pound of current output. These and other developments should gradually rectify the unfavorable features in the situation.

The sales volume fell off in March. Consumers here and abroad purchased on a moderate scale. Demand was not urgent, and sentiment inclined to be cautious. Dull periods brought out supplies at concessions. Prices reflected more or less uncertainty and moved irregularly between 10 and 10½ cents on domestic business. Export sales were on the basis of 10.30 to 10.80 cents c. i. f. European destination. Low prices for copper and controlled production are expected to bring about pronounced betterment in the whole situation.

ZINC

Conditions in zinc developed an easier tendency at the month-end on small volume business. Recent sales were at the expense of prices which show minor declines to 4 cents East St. Louis and 4.35 cents New York basis. Ore production and output of slab zinc showed some decrease. Stocks, however, on March 1 amounted to 144,389 tons. Surplus holdings are 787 tons less than on February 1, but there is an impression that the heavy accumulation is likely to diminish. Deliveries for consumption in February were the smallest in several years. Persistent overproduction has brought the selling price down abnormally.

TIN

Attention was focused on developments in connection with the prospective curtailment in tin supplies. Latest advices seem to indicate that producers have come to a satisfactory agreement for the regulation of output and sales in a manner that will eventually prove beneficial to producer and consumer alike. Current conditions show the necessity for such action, and everybody recognizes the importance of the steps taken as a constructive factor in the situation. Market values are now on a reasonable basis in comparison with the range of 38¾c and 50⅜c for Straits tin only a couple of years ago. Prices since March 1 to the present time fluctuated between 26.75c and 27.60c. This differential of 85 points is in glaring contrast with the violent changes in former years. Recent demand was in fair volume. Offerings were made with more caution and reservation.

LEAD

Early trading last month was on the basis of 4.35c East St. Louis and 4.60c New York. Large scale buying subsided, however, and on March 10 prices were reduced $2.00 per ton to 4.25c in the west and 4.50c eastern delivery. Sales at the reduced levels were limited, with no indications at present of increased activity. Most of the big consumers covered nearby requirements a few weeks ago when purchases aggregated a heavy tonnage. Recent weakness of the London market was pronounced, the drop in March being £2 12s 7d per ton. Foreign producers have met in conference in London for the purpose of agreeing on plans for cooperative curtailment. The scheme appeared to hang fire, but final conclusions have not been announced.

ALUMINUM

The market for new aluminum continues strictly steady and unchanged. This commodity therefore appears detached from influences affecting other products. Obviously this condition is unprecedented in industrial history. Remelted and secondary aluminum are subject to some price fluctuations because more responsive to the law of supply and demand. Production of new aluminum in the United States in 1930 amounted to 229,035,000 pounds with a value of $50,961,000, against 225,000,000 pounds valued at $51,864,000, in 1929. There was a falling off of consumption in some branches of industry last year. New uses were developed and other fields of consumption opened.

ANTIMONY

A materially improved tone developed in the market for antimony recently due in part to advancing silver prices and firmer attitude of Chinese sellers. Price of Chinese regulus metal was quoted for a short time at 7⅜ cents, duty paid. But as neither the rise in antimony or silver was maintained the market fell back to 7c and 7.10c for prompt and nearby delivery. Apparent United States consumption of antimony during 1930 amounted 7,130 tons. European consumption of Chinese antimony last year is estimated at 8,400 tons, an average of 700 tons monthly. Bonded stocks in this country were reported at less than 1,000 tons, and a substantial amount of this being withheld from market. Exports from China to the United States during the first two months of this year totaled only 525 tons as compared with 1,846 tons during the first two months of 1930.

QUICKSILVER

Demand for quicksilver is quiet and lacks influences to increase market activity. Prices usually quoted of $100 to $102 per flask are more or less nominal as sellers are open to bids for good sized quantities.

PLATINUM

No material change is noted in this article. Transactions are of routine character, with quotations for refined platinum at $27 to $30 per ounce. Canadian production in 1930 was 34,013 ounces, against 12,519 ounces in 1929. South African production for the first eleven months of 1930 is returned at 38,915 fine ounces, compared with 21,607 for the whole of 1929.

SILVER

The recession phase of the silver situation received a check during March. A downward trend in prices developed ten years ago. During that period world production has increased enormously and prices have suffered a shrinkage of more than one half. It is no wonder then that the silver question has gained prominence and become an international problem. Silver has lost its monetary status, and must be regarded as a commodity subject to marketable conditions. The whole fabric of commerce, national and international credit, and private and public business rests on the substantial and sound foundation of the gold standard. It is greatly to the credit of other countries that they are adopting this standard of values. Silver has wide, international markets, and henceforth will have to be sold on its merits, subject to the extent of world production and consumption. There was a rebound from the low prices of a few weeks ago. The Far East has operated both ways recently, but prices have receded from the recent high of 31⅜c to 29¾c at this writing. The government of the United States is financially strong in proportion as its gold reserves are adequate to maintain all its liabilities on that standard. Government obligations, bonds issued by corporations and municipalities specify payment in gold coin.

OLD METALS

Due to the easier tendency in the primary market, the position of scrap copper and brass was more uncertain. Offerings have increased, although high grade material has been in fair demand. Prices, however, are on a close basis for acceptable grades, and holders are not inclined to make very pronounced cuts in current quotations. Exporters and domestic consumers both show interest, particularly on copper scrap. Buyers are naturally cautious at present until the movement in new metal becomes more active. Russia has been taking a round tonnage of scrap copper from this country, and future needs will probably be arranged for in this market. Large shipments were also taken by Germany and France during the first quarter of this year. Current prices are given elsewhere in this number.

Daily Metal Prices for Month of March, 1931

Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

	2	3	4	5	6	9	10	11	12	13	16	17	18
Copper c/lb. Duty Free													
Lake (Del.)	10.625	10.625	10.625	10.625	10.625	10.625	10.625	10.625	10.375	10.125	10.375	10.375	10.375
Electrolytic (f.a.s. N. Y.)	10.50	10.50	10.50	10.50	10.50	10.50	10.50	10.50	10.25	10.00	10.25	10.25	10.25
Casting (f.o.b. ref.)	10.25	10.25	10.25	10.25	10.25	10.00	10.00	10.00	10.00	9.75	10.00	9.75	9.75
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.													
Prime Western	4.05	4.05	4.05	4.05	4.05	4.05	4.05	4.05	4.00	4.00	4.00	4.00	4.00
Brass Special	4.15	4.15	4.15	4.15	4.15	4.15	4.15	4.15	4.10	4.10	4.10	4.10	4.10
Tin (f. o. b. N. Y.) c/lb. Duty Free													
Straits	27.15	26.75	26.80	26.85	27.25	27.35	27.20	27.15	27.10	27.00	27.15	27.50	27.40
Pig 99%	26.40	26.00	26.00	26.10	26.375	26.45	26.35	26.375	26.30	26.20	26.50	26.85	26.70
Lead (f. o. b. St. L.) c/lb. Duty 2½c/lb.	4.35	4.35	4.35	4.35	4.35	4.35	4.25	4.25	4.25	4.25	4.25	4.25	4.25
Aluminum c/lb. Duty 4c/lb.	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30
Nickel c/lb. Duty 3c/lb.													
Ingot	35	35	35	35	35	35	35	35	35	35	35	35	35
Shot	36	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	35	35	35	35	35	35	35	35	35	35	35	35	35
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	7.05	7.00	7.00	7.00	7.00	7.15	7.20	7.25	7.25	7.25	7.375	7.375	7.25
Silver c/oz. Troy Duty Free	27.00	27.00	27.625	27.875	28.50	29.00	29.75	30.125	29.50	29.875	31.375	30.375	30.375
Platinum $/oz. Troy Duty Free	28.00	28.00	28.00	28.00	28.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00

	19	20	23	24	25	26	27	30	31	High	Low	Aver.
Copper c/lb. Duty Free												
Lake (Del.)	10.375	10.375	10.25	10.125	10.125	10.125	10.125	10.125	10.125	10.625	10.125	10.381
Electrolytic (f.a.s. N. Y.)	10.25	10.25	10.25	10.25	10.25	10.25	10.00	10.00	10.00	10.50	10.00	10.295
Casting (f.o.b. ref.)	9.75	9.75	9.75	9.75	9.75	9.75	9.625	9.50	9.50	10.25	9.50	9.892
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.												
Prime Western	4.00	4.00	4.00	4.00	4.00	4.00	3.95	3.95	3.95	4.05	3.95	4.011
Brass Special	4.10	4.10	4.10	4.10	4.10	4.10	4.05	4.05	4.05	4.15	4.05	4.111
Tin (f. o. b. N. Y.) c/lb. Duty Free												
Straits	27.50	27.30	27.15	26.95	27.10	26.90	26.70	26.50	26.75	27.50	26.50	27.068
Pig 99%	26.80	26.60	26.45	26.25	26.375	26.15	26.00	25.625	25.80	26.85	25.625	26.303
Lead (f. o. b. St. L.) c/lb. Duty 2½c/lb.	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.35	4.25	4.27
Aluminum c/lb. Duty 4c/lb.	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30
Nickel c/lb. Duty 3c/lb.												
Ingot	35	35	35	35	35	35	35	35	35	35	35	35
Shot	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	35	35	35	35	35	35	35	35	35	35	35	35
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	7.20	7.15	7.10	7.05	7.05	7.05	7.00	7.00	7.00	7.375	7.00	7.125
Silver c/oz. Troy Duty Free	29.75	29.625	29.25	30.00	29.25	29.375	29.00	28.75	28.75	31.375	27.00	29.188
Platinum $/oz. Troy Duty Free	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	25.00	28.00	25.00	27.136

Metal Prices, April 6, 1931

NEW METALS

Copper: Lake, 10.125. Electrolytic, 9.75. Casting, 9.50.
Zinc: Prime Western, 3.95. Brass Special, 4.05.
Tin: Straits, 26.50. Pig, 99%, 25.50.
Lead: 4.25. **Aluminum,** 23.30. **Antimony,** 7.00.
Nickel: Ingot, 35. Shot, 36. Elec., 35. Pellets, 40.
Quicksilver: flask, 75 lbs., $104. **Bismuth,** $1.50.
Cadmium, 55. **Cobalt,** 97%, $2.50. **Silver,** oz., Troy (N. Y. official price April 7) 27.25.
Gold: oz. Troy, $20.67. **Platinum,** oz., Troy, $25.00.

INGOT METALS AND ALLOYS

Brass Ingots, Yellow	7⅝to10
Brass Ingots, Red	9½to12
Bronze Ingots	10½to14
Casting Aluminum Alloys	19 to22
Manganese Bronze Castings	22 to37
Manganese Bronze Ingots	9 to11
Manganese Bronze Forgings	35 to43
Manganese Copper, 30%	23 to30
Monel Metal Shot	28
Monel Metal Blocks	28
Phosphor Bronze Ingots	10½to13
Phosphor Copper, guaranteed 15%	14½to16
Phosphor Copper, guaranteed 10%	14 to15½
Phosphor Tin, no guarantee	33 to40
Silicon Copper, 10%, according to quantity	25 to35

OLD METALS

Buying Prices		Selling Prices
7¾to 8	Crucible Copper	8¾to 9
7¼to 7¾	Heavy Copper and Wire, mixed	8¼to 8¾
6½to 7	Light Copper	7½to 8
4½to 4¾	Heavy Brass	5½to 5¾
3½to 4	Light Brass	4½to 5
6½to 7	No. 1 Composition	7½to 8
6 to 6½	Composition Turnings	7 to 7½
3¼to 3½	Heavy Lead	4¼to 4½
1½to 1¾	Old Zinc	2½to 2¾
2¼to 2½	New Zinc Clips	3¼to 3½
13 to14	Aluminum Clips (new)	14 to15
4½to 4¾	Scrap Aluminum, cast, mixed	6 to 7½
9½to10½	Scrap Aluminum sheet (old)	11 to13¼
16 to17	No. 1 Pewter	20 to22
22 to23	Nickel Anodes	24 to25
24 to25	Nickel scrap (new)	26 to29

Wrought Metals and Alloys

COPPER SHEET

Mill shipment (hot rolled).....19⅞c. to 20⅞c. net base
From Stock .....20⅞c. to 21⅞c. net base

BARE COPPER WIRE

11¾c. to 12c. net base, in carload lots.

COPPER SEAMLESS TUBING

22⅜c. to 23⅜c. net base.

SOLDERING COPPERS

300 lbs. and over in one order.....18⅜c. net base
100 lbs. to 300 lbs. in one order.....18⅞c. net base

ZINC SHEET

	Cents per lb. Net Base
Carload lots, standard sizes and gauges, at mill, less 7 per cent discount	9.50
Casks, jobbers' price	9.75
Open casks, jobbers' price	10.50 to 10.75

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga., base, ton lots, per lb..... 32.30
Aluminum coils, 24 ga., base price 30.00

ROLLED NICKEL SHEET AND ROD

Net Base Prices

Cold Drawn Rods.....	50c.	Cold Rolled Sheet.....	60c.
Hot Rolled Rods.....	45c.	Full Finished Sheet.....	52c.

BLOCK TIN SHEET

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more, 12c. over N. Y. Pig Tin; 50 to 100 lbs., 18c. over; 25 to 50 lbs., 20c. over; less than 25 lbs., 25c. over.

SILVER SHEET

Rolled sterling silver (April 7) 30.50c., Troy oz. upward, according to quantity.

BRASS MATERIAL—MILL SHIPMENTS

In effect from March 12, 1931
To customers who buy 5,000 lbs. or more in one order

	Net base per lb. High Brass	Low Brass	Bronze
Sheet	17¼c.	18⅝c.	19¼c.
Wire	17¾c.	19⅛c.	19¾c.
Rod	15½c.	19⅛c.	19¾c.
Brazed tubing	25⅛c.	.....	29⅛c.
Open seam tubing	25¼c.	.....	27¼c.
Angles and channels	25¼c.	.....	27¼c.

BRASS SEAMLESS TUBING

22⅛c. to 23⅛c. net base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod	19⅛c. net base
Muntz or Yellow Metal Sheathing (14"x48")	19¼c. net base
Muntz or Yellow Rectangular sheet other sheathing	19¼c. net base
Muntz or Yellow Metal Rod	16⅜c. net base

Above are for 100 lbs. or more in one order.

NICKEL SILVER (NICKELENE)

Net Base Prices

Grade "A" Sheet Metal		Wire and Rod	
10% Quality	25c.	10% Quality	28⅛c.
15% Quality	27¼c.	15% Quality	32⅛c.
18% Quality	28½c.	18% Quality	35⅝c.

MONEL METAL, SHEET AND ROD

Hot Rolled Rods (base)	35	Full Finished Sheets (base)	42
Cold Drawn Rods (base)	40	Cold Rolled Sheets (base)	50

BRITANNIA METAL SHEET

No. 1 Britannia—18" wide or less, No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 10c. over N. Y. tin price; 100 lbs. to 500 lbs., 12c. over; 50 to 100 lbs., 18c. over; 25 to 50 lbs., 20c. over; less than 25 lbs., 25c. over. Prices F. O. B. mill.

Supply Prices, April 6, 1931

ANODES

Copper: Cast ..... 21⅛c. per lb.
Rolled, sheets, trimmed ..... 18⅝c. per lb.
Rolled, oval ..... 18⅝c. per lb.
Brass: Cast ..... 20⅛c. per lb.
Zinc: Cast ..... 11¼c. per lb.

Nickel: 90-92% ..... 44c. to 45c. per lb.
95-97% ..... 44c. to 47c. per lb.
99% ..... 46½c. to 49c. per lb.
Silver: Rolled silver anodes .999 fine were quoted April 7 from 30.25c. per Troy ounce upward, depending upon quantity.

FELT POLISHING WHEELS WHITE SPANISH

Diameter	Thickness	Under 50 lbs.	50 to 100 lbs.	Over 100 lbs.
10-12-14 & 16	1" to 2"	$3.00/lb.	$2.75/lb.	$2.65/lb.
10-12-14 & 16	2 to 3½	3.00	2.70	2.50
6-8 & over 16	1 to 3½	3.10	2.85	2.70-2.75
6 to 24	Under ½	4.25	4.00	3.90
6 to 24	½ to 1	4.00	3.75	3.65
6 to 24	Over 3	3.40	3.15	3.05
4 to 6	¼ to 3	4.85	4.85	4.85
4 to 6	Over 3	5.25	5.25	5.25
Under 4	¼ to 3	5.45	5.45	5.45
Under 4	Over 3	5.85	5.85	5.85

On grey Mexican wheels deduct 10c. per lb. from White Spanish.

COTTON BUFFS

Full Disc Open buffs, per 100 sections.

11" 20 ply 64/68 Unbleached	$16.38 to 20.28
14" 20 ply 64/68 Unbleached	24.32 to 30.12
11" 20 ply 80/92 Unbleached	20.48 to 25.36
14" 20 ply 80/92 Unbleached	30.17 to 37.37
11" 20 ply 84/92 Unbleached	24.60 to 35.59
14" 20 ply 84/92 Unbleached	36.53 to 52.80
11" 20 ply 80/84 Unbleached	26.35 to 32.63
14" 20 ply 80/84 Unbleached	39.06 to 48.38
Sewed Pieced Buffs, per lb., bleached	.30c. to 79c.

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone	lb.	.09¾-.14
Acid—Boric (Boracic) Crystals	lb.	.07¾
Chromic, 75 to 400 lb. drums	lb.	.16½-.20
Hydrochloric (Muriatic) Tech., 20 deg., carboys	lb.	.02
Hydrochloric, C. P., 20 deg., carboys	lb.	.06
Hydrofluoric, 30%, bbls.	lb.	.08
Nitric, 36 deg., carboys	lb.	.06
Nitric, 42 deg., carboys	lb.	.07
Sulphuric, 66 deg., carboys	lb.	.02
Alcohol—Butyl	lb.	.15¾-.21¼
Denatured, drums	gal.	.37-.50
Alum—Lump, barrels	lb.	.03¾-.04
Powdered, barrels	lb.	.03½-.04
Ammonium sulphate, tech., bbls.	lb.	.03½
Sulphocyanide	lb.	.36
Arsenic, white, kegs	lb.	.05
Asphaltum	lb.	.35
Benzol, pure	gal.	.58
Borax Crystals (Sodium Biborate), bbls.	lb.	.04½
Calcium Carbonate (Precipitated Chalk)	lb.	.04
Carbon Bisulphide, Drums	lb.	.06
Chrome Green, bbls.	lb.	.24
Chromic Sulphate	lb.	.30-.40
Copper—Acetate (Verdigris)	lb.	.23
Carbonate, bbls.	lb.	.16½
Cyanide (100 lb. kgs.)	lb.	.41
Sulphate, bbls.	lb.	.0495
Cream of Tartar Crystals (Potassium Bitartrate)	lb.	.27
Crocus	lb.	.15
Dextrin	lb.	.05-.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Fluor-spar (Calcic fluoride)	ton	$70.00
Gold Chloride	oz.	$12.00
Gum—Sandarac	lb.	.26
Shellac	lb.	.59-.61
Iron Sulphate (Copperas), bbl.	lb.	.01½
Lacquer Solvents	gal.	.85
Lead Acetate (Sugar of Lead)	lb.	.13¼
Yellow Oxide (Litharge)	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.58
Nickel—Carbonate, dry bbls.	lb.	.32
Chloride, bbls.	lb.	.18-.19½
Salts, single, 300 lb. bbls.	lb.	.10½-.13
Salts, double, 425 lb. bbls.	lb.	.10½-.13
Paraffin	lb.	.05-.06
Phosphorus—Duty free, according to quantity	lb.	.35-.40
Potash Caustic Electrolytic 88-92% broken, drums	lb.	.08
Potassium Bichromate, casks (crystals)	lb.	.09¼
Carbonate, 96-98%	lb.	.07
Cyanide, 165 lbs. cases, 94-96%	lb.	.57½-.60
Pumice, ground, bbls.	lb.	.02½
Quartz, powdered	ton	$30.00
Rosin, bbls.	lb.	.04½
Rouge, nickel, 100 lb. lots	lb.	.25
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in bbls.	lb.	.04½-.05¾
Silver Chloride, dry, 100 oz. lots	oz.	.25¾
Cyanide (fluctuating)	oz.	.33
Nitrate, 100 ounce lots	oz.	.22½
Soda Ash, 58%, bbls.	lb.	.02½
Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.16½-.17
Hyposulphite, kegs	lb.	.03½-.04
Nitrate, tech., bbls.	lb.	.03½
Phosphate, tech., bbls.	lb.	.03¾
Silicate (Water Glass), bbls.	lb.	.02
Sulphocyanide	lb.	.32½-.42½
Sulphur (Brimstone), bbls.	lb.	.02
Tin Chloride, 100 lb. kegs	lb.	.28
Tripoli, Powdered	lb.	.03
Wax—Bees, white, ref. bleached	lb.	.60
Yellow, No. 1	lb.	.45
Whiting, Bolted	lb.	.02½-.06
Zinc, Carbonate, bbls.	lb.	.11
Chloride, casks	lb.	.06¾
Cyanide (100 lb. kegs)	lb.	.38
Sulphate, bbls.	lb.	.03½